

INVESTIGATION OF THE EFFECT OF
STIFFNESS OF MEMBERS UPON
THE SOLUTION OF VIERENDEEL TRUSSES

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UPON THE SOLUTION OF VIERENDEEL TRUSSES

by

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Thesis
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this thesis.

Introduction

A Vierendeel Truss is composed of a series of rectangular or trapezoidal panels without diagonal members. It is named for its inventor, Professor Arthur Vierendeel of the University of Louvain in Belgium. This type of truss has been popular in Europe, particularly in Belgium, since 1896 when the first bridge of this type was built in that country. In the United States its use to date has been limited to concrete viaduct bents, small roof trusses, and rigid frame foundations for buildings. It has been reported that a bridge using a concrete Vierendeel Truss system has been built recently on the West Coast, but as yet there is no printed matter available on that project.

The Vierendeel presents an exceptionally good appearance, the elimination of diagonals allowing a very clean looking structure. Its slow adaption in this country may be attributed to two factors; (1) until recently the only methods of solution were extremely long and tedious, sufficiently so to discourage only the most able and experienced in the field of structural design, and (2) the use of this truss has been so limited in this country that very few examples are available from which to make an intelligent investigation of the economic aspects of the problem.

METHOD OF SOLUTION

The method of solution used throughout this thesis was an application of slope deflection as outlined by Mr. A. Amirikian in his "Analysis of Rigid Frames". While there are other methods available for the solution of Viorendeel trusses it was felt that the procedure outlined by Mr. Amirikian was the simplest and most direct approach to the problem published to date. Inasmuch as his text has become a standard addition to all libraries of treatises on Indeterminate Structures, none of the derivations will be presented here and only a brief outline of the basic formulae and procedures will be given.

By way of simplifying the fundamental moment equation of a member having constant moment of inertia and modulus of elasticity

$$M_{AB} = 2 E \frac{I}{L} (2\theta_A + \theta_B - 3 \frac{\Delta}{L}) - FM_{AB}$$

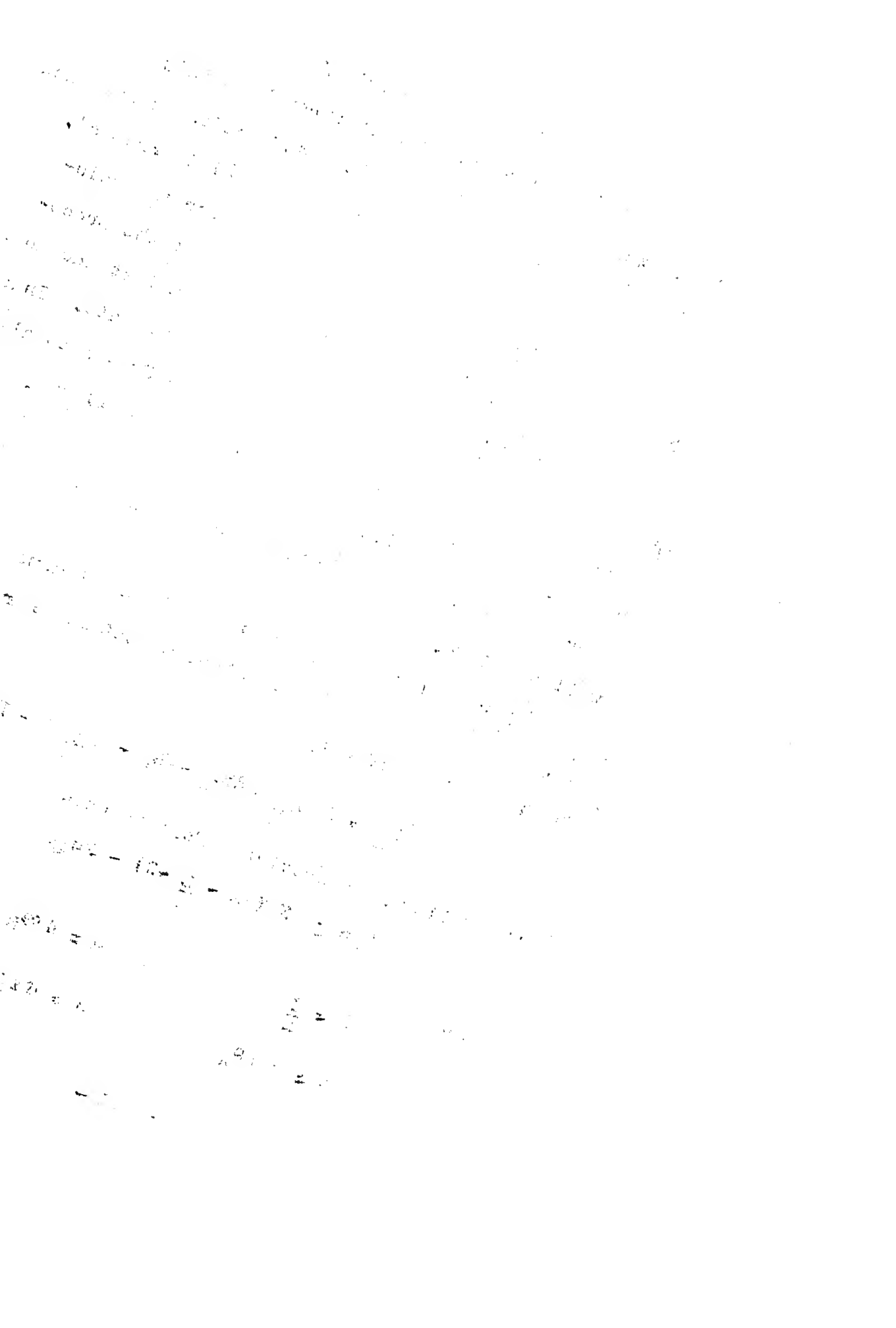
the following abbreviated form is used

$$M_{AB} = K (A + \frac{B}{2} - R) - FM_{AB}$$

where

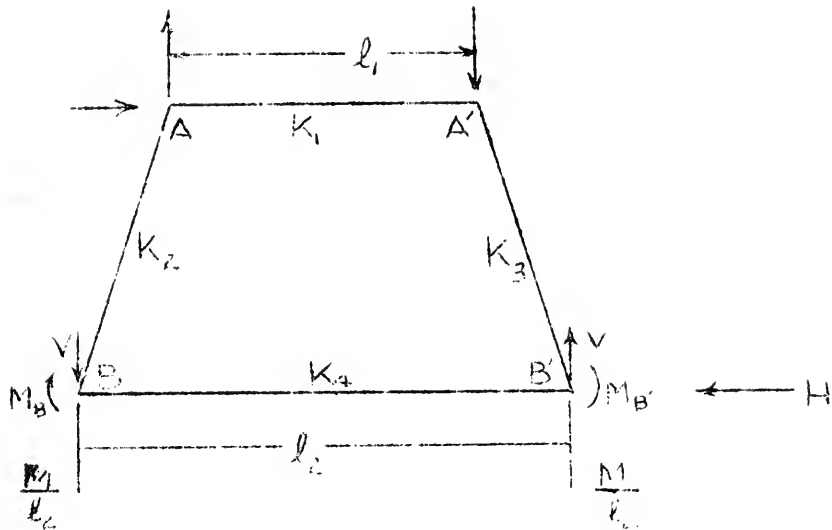
$$K = \frac{I}{L} \qquad B = 4E\theta_B$$

$$A = 4 E\theta_A \qquad R = 6E \frac{\Delta}{L}$$



This simplification is used throughout the solution and greatly reduces the tediousness of the more complex equations.

Upon connecting four of these beams to form a panel and a series of panels to form a truss, the interdependence of the members and joints becomes pronounced. In order to consider the effect of varying stiffnesses in members forming or adjacent to a joint on both the moment at the joint and the deflection in the beam, expressions are developed for each joint encountered. These expressions will be known hereafter as the Joint and Deflection Equations. Likewise the moments obtained in the solution of any joint will vary widely with the shape of the panel, moments and shears applied and location of application, and the stiffnesses of the panel under consideration. In order to take these variables into consideration, Load Constant Equations are derived for each joint. Upon solution of these equations the load constant is equated to the Joint and Deflection equations which are then solved to find the deflection angles of the joints and the deflection of the adjacent member. Because of its basic nature the fundamental expression for the load constants of a typical panel are reproduced here in part.



$$(a) \quad M_B + M_{B'} = V l_2 - H$$

$$(b) \quad M_A + M_{A'} + M_B + M_{B'} = V(l_2 - l_1) - Hh$$

Substituting V from (a) in (b)

$$(c) \quad M_A + M_{A'} + (1-m)(M_B + M_{B'}) = mH - Hh$$

where

M = overturning moment of the external forces taken about the bottom of the panel.

H = shear, i.e., the sum of the lateral forces above the panel.

V = vertical reaction just above the bottom joints of the panel.

M_A = end moments at top.

M_B = end moments at bottom.

Q = values of load constant for joint or panel under consideration.

$$m = \frac{l_2 - l_1}{l_2}$$

$$n = \frac{l_1 - l_2}{l_1}$$

By substituting the right hand part of equation (c) in a previously developed shear expression for a typical joint equation we arrive at load constants for a typical panel

$$Q \text{ of R} = \frac{Hh - mM}{(2-m)(k_2 - k_3)}$$

$$Q \text{ of A} = \frac{(nk_1 - k_2)(Hh - mM)}{(2-m)(k_2 - k_3)}$$

$$Q \text{ of B} = \frac{k_2 (mM - Ph)}{(2-m)(k_2 - k_3)}$$

Further importance is attached to equation (c) inasmuch as it acts as a check for the moment values obtained in the solution of any panel.

The procedure for the solution of Vierendeel trusses is an adaptation of this single panel solution. In order to avoid the difficulty of an exact solution the truss is first treated as a system of separate and independent panels. Each panel is solved for its own load neglecting moment introduced from other panels via the joints. To compensate for the error introduced in the original computation the solution is repeated, this time using the moments obtained from adjacent panels as the new load constants for the panel being solved. The procedure is repeated, again interchanging moment increments between panels. Inasmuch as these increments diminish in size rapidly, two corrections will ordinarily provide a solution of sufficient accuracy.

The final moment will be the algebraic sum of the original moment determination and the successive increments.

For the Vierendeel truss used in this design with all loads applied at the panel points and the upper and lower chords having the same stiffness ratio, the deflection angles of the top chord joints will equal those of the respective bottom chord joints, and the joint and deflection equations become:

$$1.5K_1 + K_2 + \frac{(3 - m)(nk_1 - k_2)}{2(2 - m)} A =$$

$$\frac{k_2}{2} + \frac{(3 - 2m)(nk_1 - k_2)}{2(2 - m)} B = -Q_A$$

$$k_2 + 1.5K_4 + \frac{(3 - 2m)k_2}{2(2 - m)} B =$$

$$\frac{k_2}{2} + \frac{(3 - m)k_2}{2(2 - m)} A = -Q_B$$

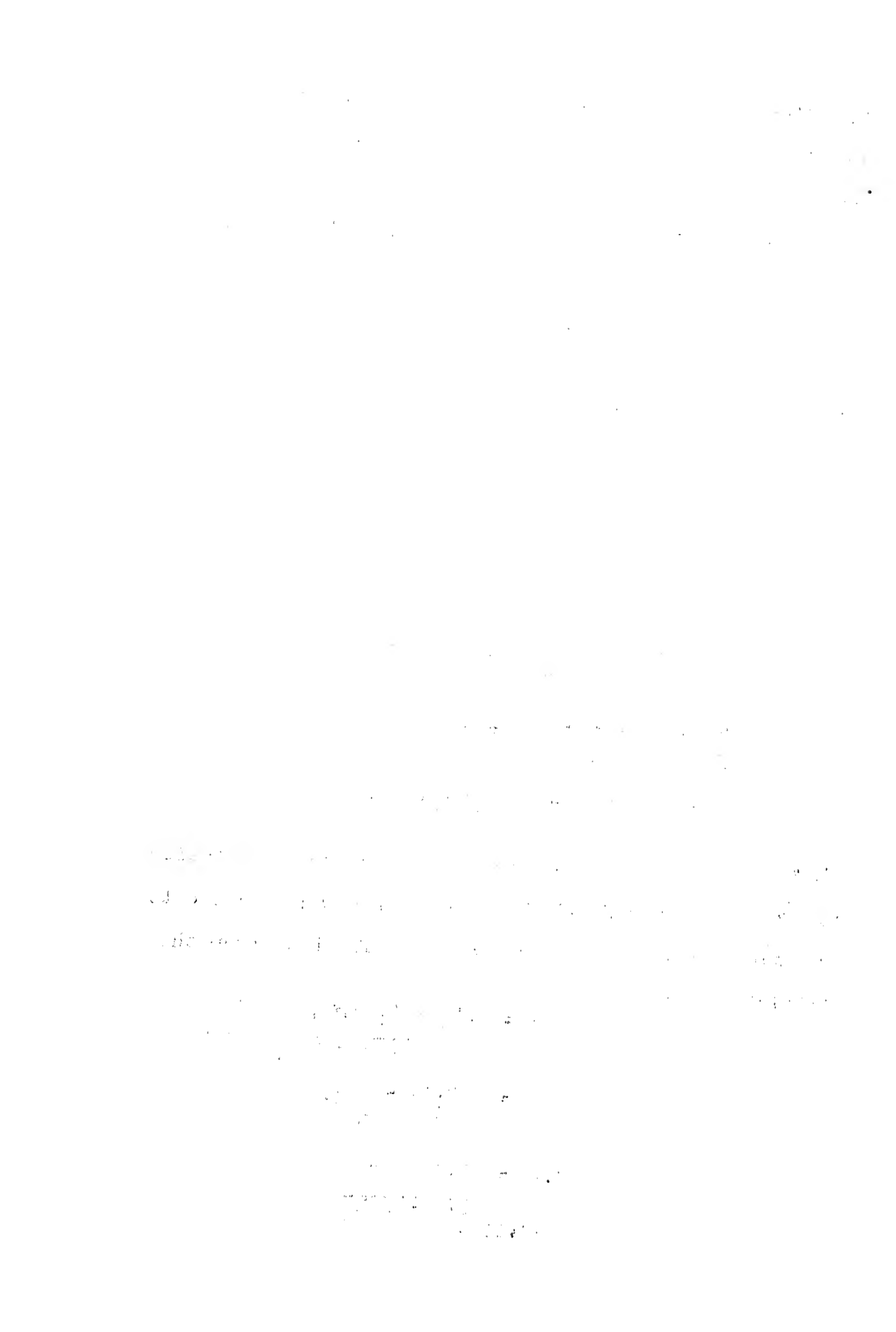
$$R_1 = \frac{(3 - m)A - (3 - 2m)B}{2(2 - m)} = Q_{R1}$$

These equations, with appropriate K and angle notation are set up for each of the eight panels and equated to the corresponding load constants as obtained from the following formulae:

$$-Q_A = \frac{(nk_1 - k_2)(m\bar{l}_1 - H_1l_1)}{2(2 - m)k_2}$$

$$-Q_B = \frac{(H_1l_1 - m\bar{l}_1)}{2(2 - m)}$$

$$Q_{R1} = \frac{H_1l_1 - m\bar{l}_1}{2(2 - m)k_2}$$



The two equations in A and B obtained from the solutions of these sets of equations are then solved simultaneously and the value for R_1 determined. Substituting in the fundamental moment formulae

$$M_{AB} = K \left(A + \frac{B}{2} - R_1 \right)$$

$$M_{BA} = K \left(B + \frac{A}{2} - R_1 \right)$$

the original moment values for the panel are obtained. These moments are then corrected and the sum of the original moment plus corrections give us the final moment values.

Influence lines were plotted for the final moment values and design moments based on the combined loadings of one E-60 railroad rail and one lane of H15 - S12 - 44 highway loading were computed.

PURPOSE

The purpose of this investigation is to determine the influence of the assumed stiffnesses of the members upon the eventual design of the truss.

In the design of a Vierendeel truss by the method previously described, the first step is to assume a basic truss and loading system. A solution is then worked for this primary system, corrected for the actual loads and conditions, and the solution repeated with appropriate corrections to arrive at the final design, usually three or more solutions being required.

Upon embarking upon this type of solution, the engineer is faced with two fundamental assumptions, (a) the loading to be used, and (b) the stiffnesses to select for his members. The first of these may be handled in the conventional manner, i.e. assume a loading of one kip and compute values for plotting influence lines to which he may later apply his design loads.

The second assumption, selecting appropriate stiffnesses for his members, presents a more difficult problem. Unfortunately so little material has been published on Vierendeel trusses in this country that there is little to guide him in this step.

Likewise the rarity of this type of structure in the United States makes it extremely unlikely that he could obtain any useful data on existing trusses of this type. Obviously it is up to the engineer to make such assumptions as he sees fit. In order to do this properly he should, of course, have some advanced knowledge of the distribution of moments throughout the truss in order that he could correctly proportion his stiffnesses to their appropriate moments. Previous experience lacking, he will be forced to estimate the probable moment intensities and select stiffnesses accordingly. This procedure leaves much to be desired, for regardless of a man's previous experience it is not to be expected that he could closely approximate the distribution of moments in a truss entirely unfamiliar to him, and his stiffness values will be subject to the same degree of uncertainty.

The question now arises as to the degree in which the assumed values of stiffnesses will affect the solution of the truss. It will be noted that the stiffness factor K occurs in four of the six basic equations for the solution, and it might be supposed that any wide variation in the true and assumed values of K would produce a similar

variation in the moment values obtained. It is the purpose of this thesis to determine the effect of widely varying stiffness values upon moments in a typical Vierendeel truss. The case selected was for a 240 foot lift span for a lift bridge across the entrance to a harbor inlet. The span is to carry one lane of highway traffic on each side of a single track standard gauge railway.

FIRST SOLUTION

For the first solution K values were chosen primarily from sample problems accompanying an article on Vierendeel trusses by Mr. Dan Young in the 1937 Proceedings of the A. S. C. E. Whether or not Mr. Young intended that the stiffness values in his problem should closely approximate actual conditions is unknown. On the condition that these values might approximate the trend of moment distribution, our assumed values were made to follow a similar pattern of variation.

SECOND SOLUTION

For the second solution the values of \underline{K} were arrived at by using the moments obtained in the first solution. Since

$$K = \frac{I}{L} = \frac{Mc}{fL}$$

it was possible to solve directly for a value of \underline{K} , inasmuch as members of constant depth (30") were proposed to improve the appearance of the truss and f and L were known values. In this way it was possible to determine the effect of closely approximating moment and stiffness values throughout the truss.

THIRD SOLUTION

For the third solution all K values were assumed to be unity. It was felt that since both moment and stiffness values vary throughout the truss that by holding one of these constant it might be possible to observe the variation of the other. In this way the stiffness values of the second set of computations of any truss might be made to closely approximate the stiffnesses required by the actual moments and thus expedite and simplify the final design of the truss.

FOURTH SOLUTION

For purposes of contrast the stiffness values of the fourth solution were taken exactly opposite to those of the first solution. In other words the same numerical values were used but varying in an inverse order of the first solution. In this way it was hoped to observe the effect of the direction of variations of stiffness values upon the moments computed.

DESIGN MOMENTS

Member	Set 1		Set 2		Set 3		Set 4	
	K	M	K	M	K	M	K	M
AA'	4	7,362	160	7,222	1	7,689	1	7,987
BB'	3	11,745	232	11,762	1	10,600	1	9,030
CC'	2	7,243	136	7,575	1	7,781	2	8,497
DD'	1	4,046	74	4,447	1	5,170	3	5,844
EE'	1	2,593	47	3,000	1	3,282	4	3,435
AB	2	7,958	200	7,212	1	7,689	4	7,987
BC	3	5,360	134	5,492	1	5,465	4	7,329
CD	4	3,548	90	3,529	1	4,043	3	4,436
DE	4	3,790	95	2,877	1	3,020	2	2,986

For purposes of clarity the tabulated results of the moment solutions have been put in graph form on the following pages. Taking web and chord members separately the values of moment and stiffness were plotted for each member for a given solution. The plotted points were then connected in order to indicate the trends of variation of both moment and stiffness. With one exception the moments and stiffnesses as plotted represent the actual values obtained and used in the solution. The one exception is in the case of the second solution. Here the values of K ranged from 200 to 47 and would have been at best unwieldy to plot on the scale adopted. Inasmuch as the numerical value of K appears to affect the solution only in its relative size compared to the other K values the K's for this solution were plotted on a relative scale. By taking $K = 47$ as unity the other K values were reduced to the same relative scale by dividing by 47, greatly simplifying plotting operations and presenting a better method of comparison with the other solutions.

In examining the first solution curves there is little evidence to indicate any direct relationship in the variation of the K values assumed and

the moments obtained. In the case of the web members, CC' and DD' have similar relationships of moment and stiffness. There is an inverse relationship occurring in the case of the other three members. As for the chord members, the inverse relationship exists throughout, high moment values accompanying low stiffness values and vice versa.

1. The first part of the paper is devoted to the study of the properties of the function $f(x)$ defined by the equation $f(x) = \int_0^x f(t) dt$. It is shown that $f(x)$ is a constant function, and its value is determined by the initial condition $f(0) = 1$.

2. In the second part, we consider the function $g(x)$ defined by the equation $g(x) = \int_0^x g(t) dt$. It is shown that $g(x)$ is a constant function, and its value is determined by the initial condition $g(0) = 1$.

3. The third part of the paper is devoted to the study of the properties of the function $h(x)$ defined by the equation $h(x) = \int_0^x h(t) dt$. It is shown that $h(x)$ is a constant function, and its value is determined by the initial condition $h(0) = 1$.

4. In the fourth part, we consider the function $k(x)$ defined by the equation $k(x) = \int_0^x k(t) dt$. It is shown that $k(x)$ is a constant function, and its value is determined by the initial condition $k(0) = 1$.

5. The fifth part of the paper is devoted to the study of the properties of the function $l(x)$ defined by the equation $l(x) = \int_0^x l(t) dt$. It is shown that $l(x)$ is a constant function, and its value is determined by the initial condition $l(0) = 1$.

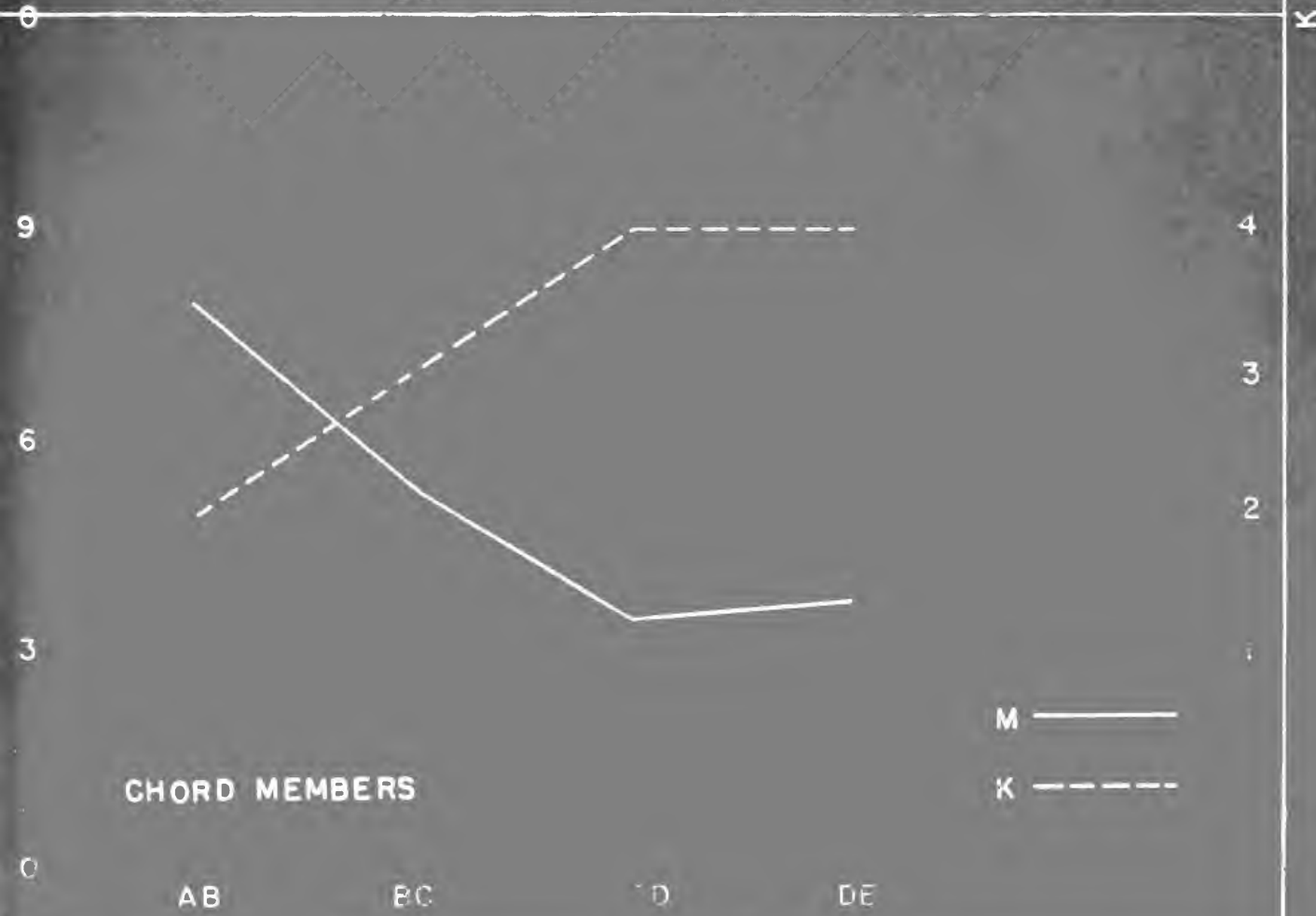
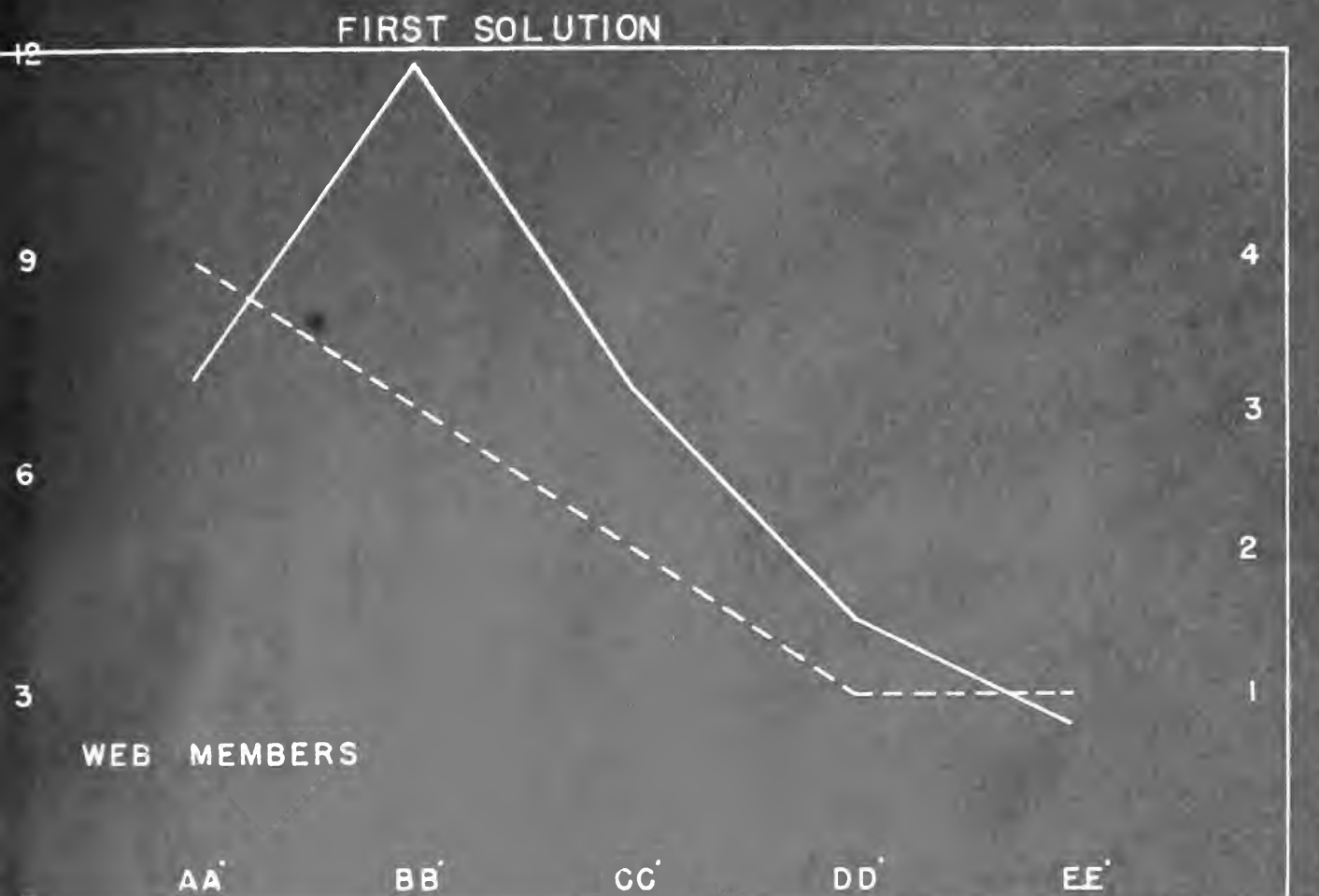
6. In the sixth part, we consider the function $m(x)$ defined by the equation $m(x) = \int_0^x m(t) dt$. It is shown that $m(x)$ is a constant function, and its value is determined by the initial condition $m(0) = 1$.

7. The seventh part of the paper is devoted to the study of the properties of the function $n(x)$ defined by the equation $n(x) = \int_0^x n(t) dt$. It is shown that $n(x)$ is a constant function, and its value is determined by the initial condition $n(0) = 1$.

8. In the eighth part, we consider the function $o(x)$ defined by the equation $o(x) = \int_0^x o(t) dt$. It is shown that $o(x)$ is a constant function, and its value is determined by the initial condition $o(0) = 1$.

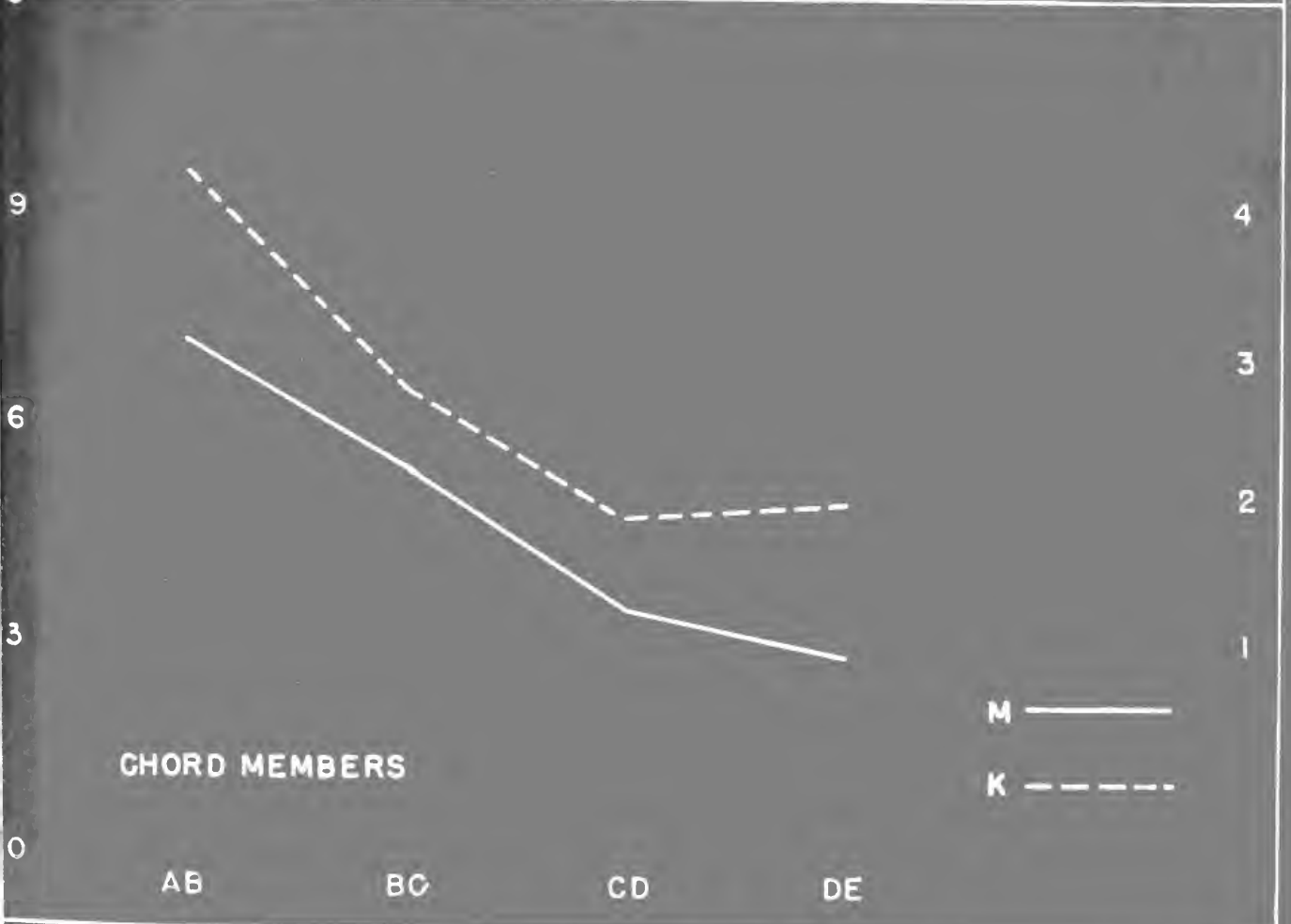
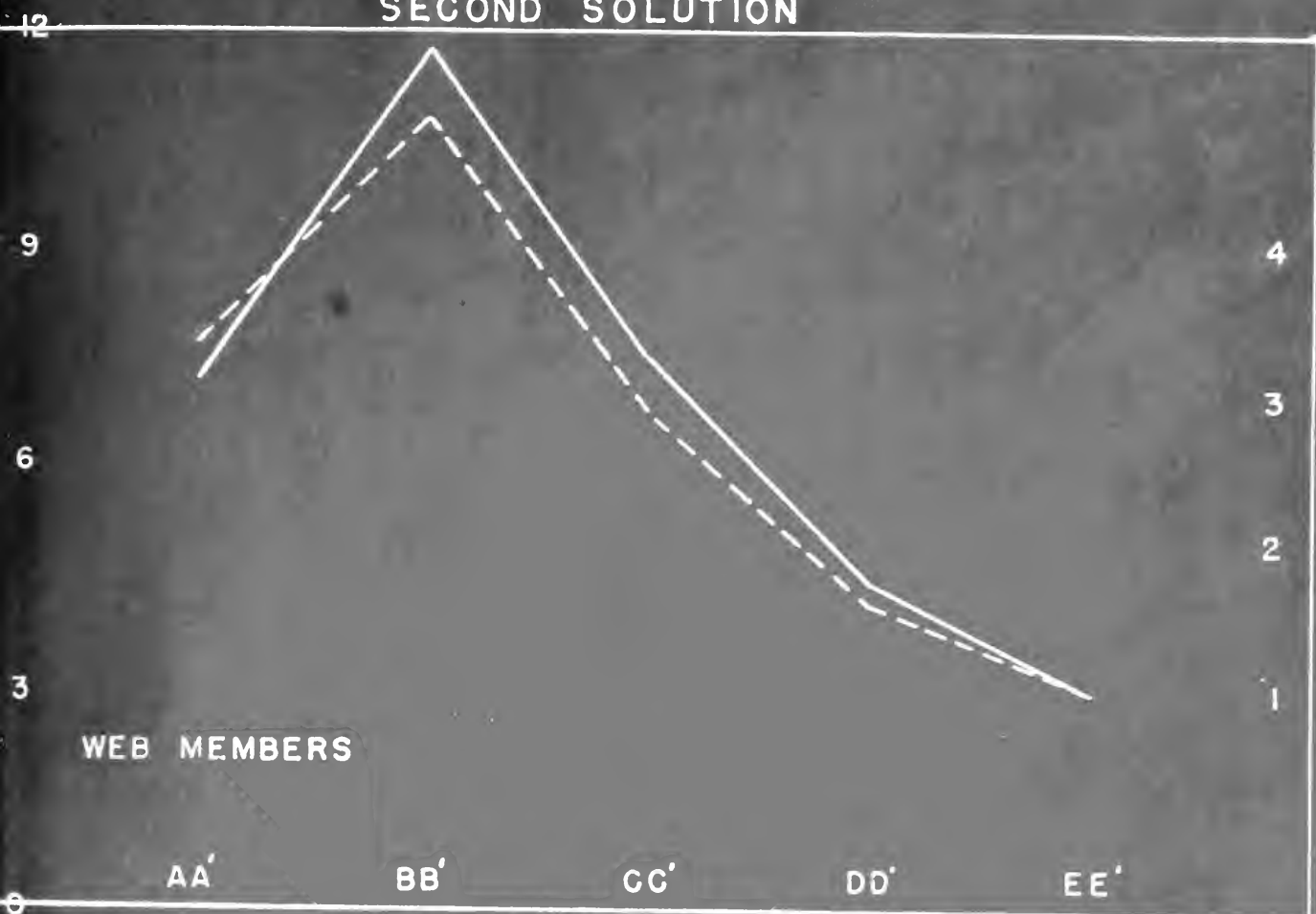
9. The ninth part of the paper is devoted to the study of the properties of the function $p(x)$ defined by the equation $p(x) = \int_0^x p(t) dt$. It is shown that $p(x)$ is a constant function, and its value is determined by the initial condition $p(0) = 1$.

10. In the tenth part, we consider the function $q(x)$ defined by the equation $q(x) = \int_0^x q(t) dt$. It is shown that $q(x)$ is a constant function, and its value is determined by the initial condition $q(0) = 1$.



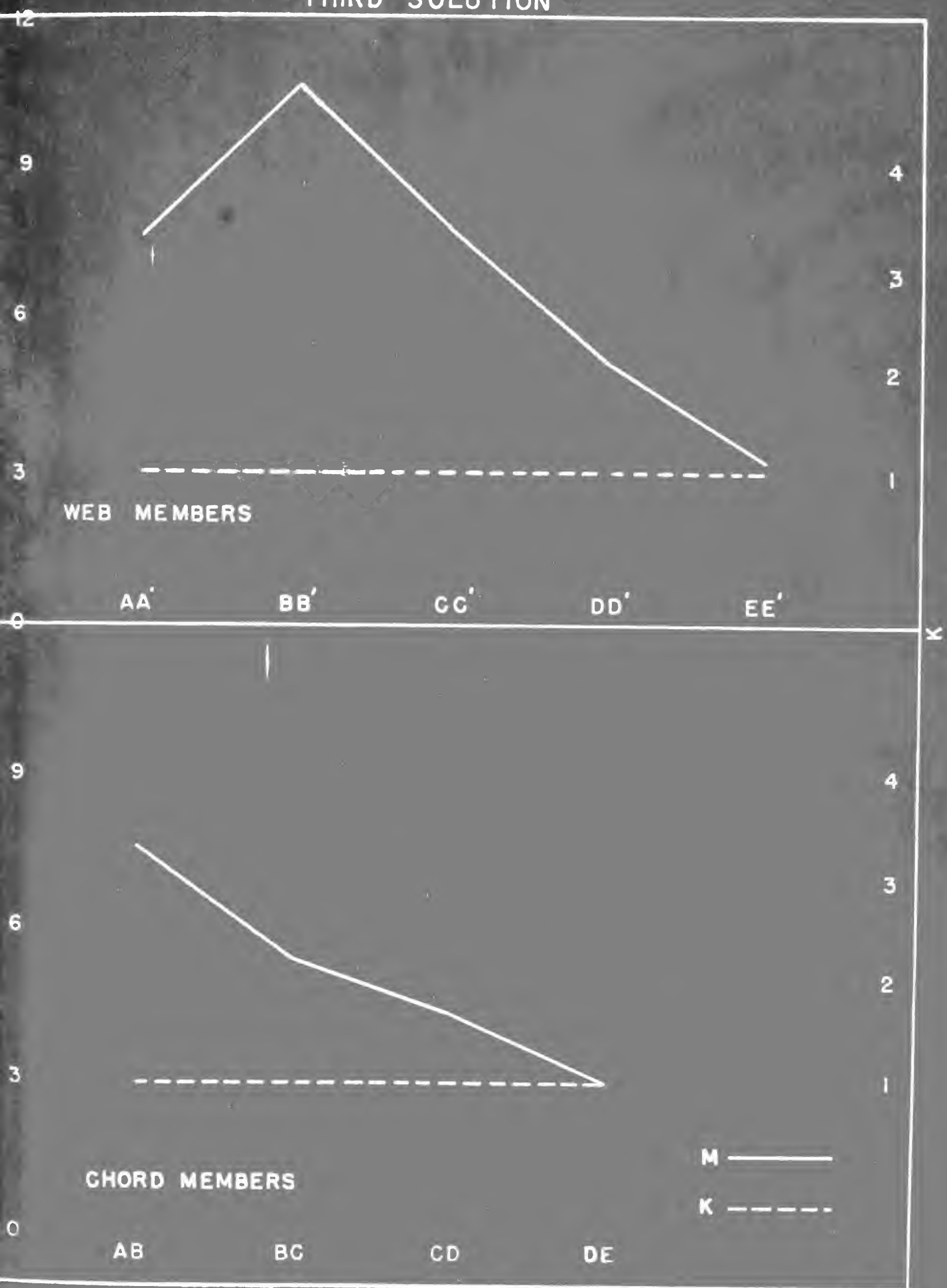
The second solution represents a case in which the general trend of moment values closely follows the trend of the stiffness values assumed, with the sole exception of member DE. It is to be noted that there is no proportionality or direct relationship between the values of K and M . While the picture thus presented might seem to indicate a general tendency for moment values to follow stiffness assumptions, it must be remembered that the stiffness values for this solution were obtained directly from the moment values of the previous solution. In effect the moment values have changed but little and by the nature of their assumption it is to be expected that the stiffness values would vary in much the same way as the moment values.

SECOND SOLUTION



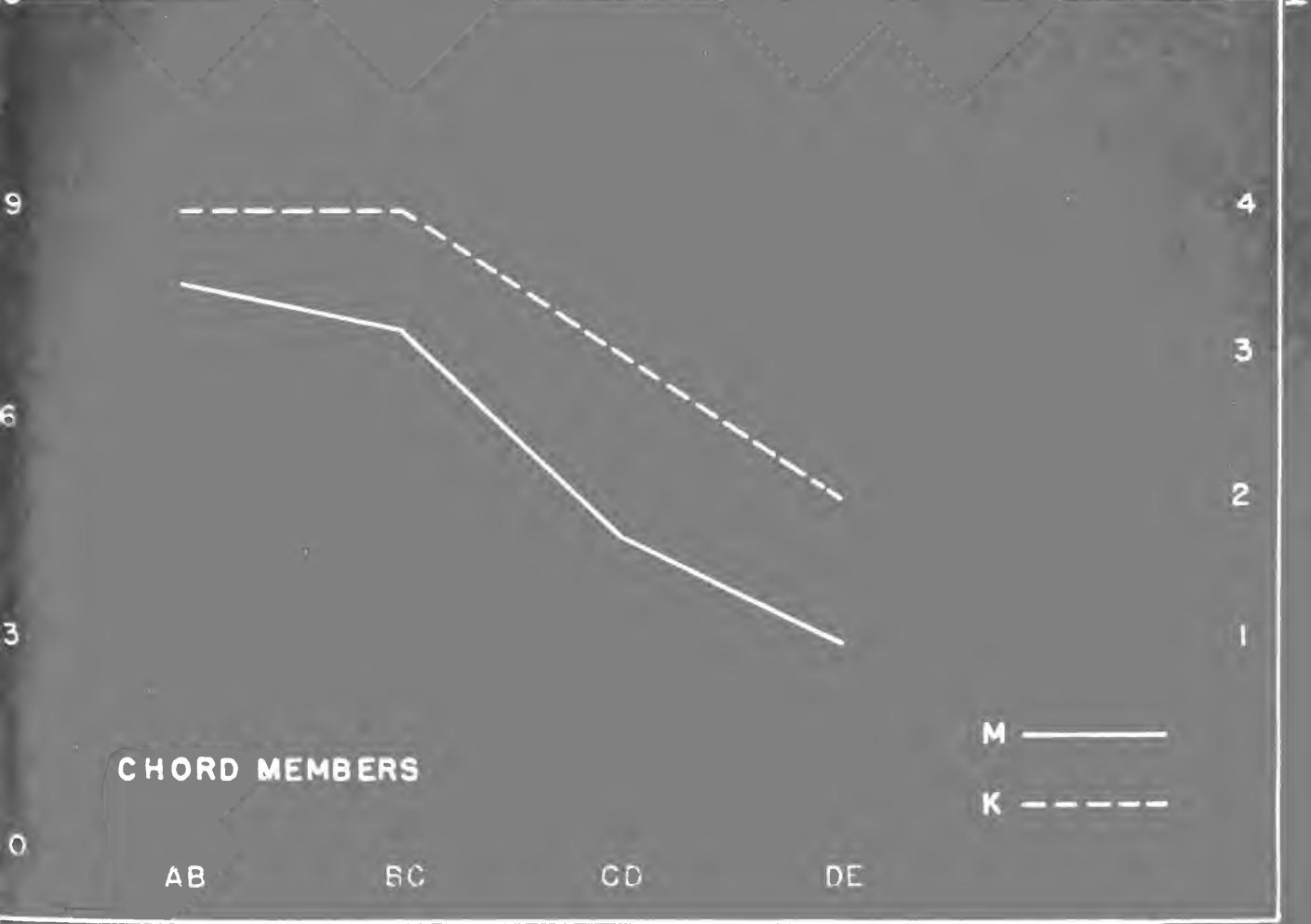
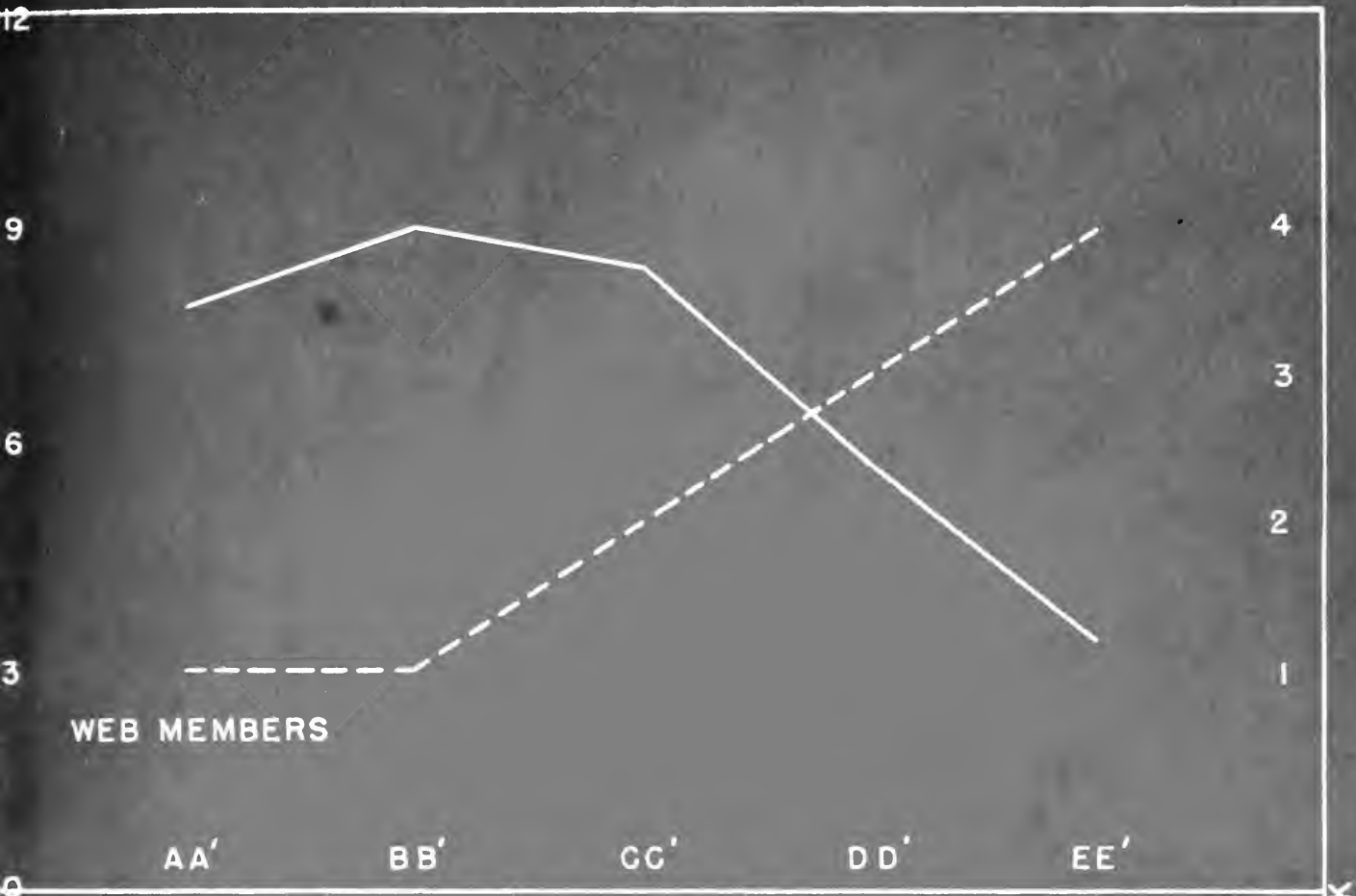
The third solution is unique in that it presents an unvarying stiffness curve, all values of K being unity. It is to be noticed that in neither size nor pattern of variation do the moment values differ substantially from the previous solutions. At no place do either of the moment curves display any tendency to follow or parallel the trend of the K values assumed.

THIRD SOLUTION



The fourth solution graph represents a system of stiffness values assumed in an exactly inverse order of those chosen for the first solution. Contrary to the results obtained in that solution we now find that the chord moments tend to follow the same general pattern as their corresponding K values while the web members follow a completely dissimilar path from their K values. As before there is but little variation in either the size or trend of the moments obtained as compared with the resultant moments of the first solution.

FOURTH SOLUTION



M ———
K - - - -

CONCLUSIONS

The results obtained from the four solutions presented show but one common trend, i.e. in no case do the resultant moments of any solution differ widely from those of any other solution. Conversely the stiffness values assumed for any one solution differ widely from those of all other solutions. No relating tendencies are disclosed, a lower stiffness value does not in every case bring a lower moment nor does a higher stiffness value display any significant effect on moments obtained. Likewise a change in the direction of variation of stiffness values seems to have little effect on the moments obtained. Therefore it must be concluded that the size, direction, or degree of variation of assumed values of stiffness of members does not materially affect the moments obtained in the first solution of a Vierendeel truss by this method.

In view of these conclusions it is recommended that in the solution of trusses by this method the first solution be worked with the assumption of all K values as unity. Such an assumption would permit a simpler and quicker solution of the truss with no loss of accuracy.

Introduction

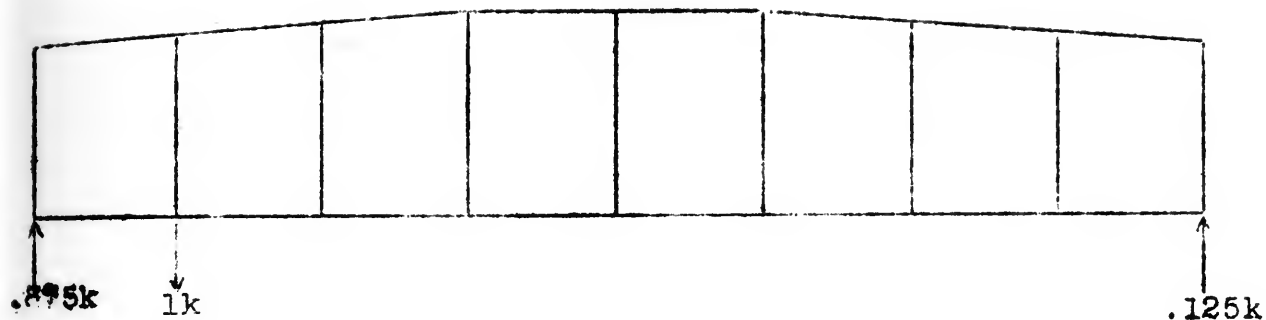
The purpose of this study is to investigate the effects of a new teaching method on student performance. The study was conducted over a period of six months, during which time the new method was implemented in a classroom setting. The results of the study are presented in the following sections. The first section describes the methodology used in the study, including the selection of participants and the design of the experiment. The second section presents the data collected during the study, and the third section discusses the results of the analysis. The final section provides a conclusion and suggests areas for further research.

The study was conducted in a classroom setting, and the participants were students from a local high school. The new teaching method was implemented in a classroom setting, and the results of the study are presented in the following sections. The first section describes the methodology used in the study, including the selection of participants and the design of the experiment. The second section presents the data collected during the study, and the third section discusses the results of the analysis. The final section provides a conclusion and suggests areas for further research.

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.0866	.0443	.0482	0	0	.0482	.0443	.0866
.0942	.0463	.0507	0	0	.0507	.0463	.0942
.875	-.125	-.125	-.125	-.125	-.125	-.125	-.125
26.25	22.50	18.75	15.00	-15.00	-11.25	-7.50	-3.75

Panel 1

$$-Q_A = \frac{(.0942 \times 4 - 2)(.0866 \times 26.25 - .875 \times 30)}{2(2 - .0866)2} = 5.32$$

$$-Q_B = \frac{(.875 \times 30 - .0866 \times 26.25)}{2(2 - .0866)} = 6.27$$

$$Q_{R1} = \frac{(.875 \times 30 - .0866 \times 26.25)}{2(2 - .0866)2} = 3.14$$

Panel 2

$$-Q_B = \frac{(.0463 \times 3 - 3)(.0443 \times 22.5 - .125 \times 30)}{2(2 - .0443)3} = -1.16$$

$$-Q_C = \frac{(-.125 \times 30 - .0443 \times 22.5)}{2(2 - .0443)} = -1.21$$

$$Q_{R2} = \frac{(-.125 \times 30 - .0443 \times 22.5)}{2(2 - .0443)3} = -0.40$$

Panel 3

$$-Q_C = \frac{(.0507 \times 2 - 4)(.0482 \times 18.75 + .125 \times 30)}{2(2 - .0482)^4} = -1.16$$

$$-Q_D = \frac{(-.125 \times 30 - .0482 \times 18.75)}{2(2 - .0482)} = -1.19$$

$$Q_{R3} = \frac{(-.125 \times 30 - .0482 \times 18.75)}{2(2 - n)^4} = -.30$$

Panel 4

$$-Q_D = \frac{(0 - 4)(0 + .125 \times 30)}{2(2)^4} = -.94$$

$$-Q_E = \frac{(-.125 \times 30 - 0)}{2 \times 2} = -.94$$

$$Q_{R4} = \frac{-.125 \times 30 - 0}{2(2)^4} = -.23$$

Panel 5

$$-Q_E = \frac{-.125 \times 30}{4} = -.94$$

$$-Q_F = \frac{-.125 \times 30}{4} = -.94$$

$$-Q_{R5} = \frac{-.125 \times 30}{4 \times 4} = -.23$$

Panel 6

$$-Q_G = \frac{(.0517 \times 2 - 4) - (.0482 \times 11.25 + .125 \times 30)}{2(2 - .0482)^4} = -.80$$

$$-Q_F = \frac{(-.125 \times 30 + .0482 \times 11.25)}{2(2 - .0482)} = -.82$$

$$-Q_{R6} = \frac{(-.125 \times 30 + .0482 \times 11.25)}{2(2 - .0482)^4} = -.20$$

Panel 7

$$-Q_H = \frac{(.0463 \times 3 - 3)(.0443 \times -7.5 - -.125 \times 30)}{2(2 -.0443)^3} = -.083$$

$$-Q_G = \frac{(-.125 \times 30 -.0443 \times -.75)}{2(2 -.0443)} = -0.87$$

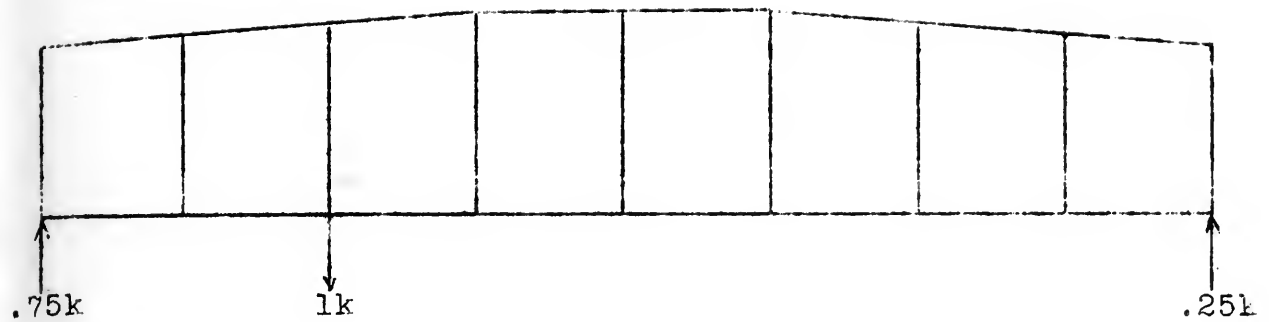
$$-Q_{R7} = \frac{(.125 \times 30 -.0443 \times -.75)}{2(2 -.0443)^5} = -0.29$$

Panel 8

$$-Q_I = \frac{(.0942 \times 4 - 2)(.0861 \times -3.75 - -.125 \times 30)}{2(2 -.0861)^2} = -0.73$$

$$-Q_H = \frac{(-.125 \times 30 -.0861 \times -3.75)}{2(2 -.0861)} = -0.90$$

$$Q_{R8} = \frac{(-.125 \times 30 -.0861 \times -3.75)}{2(2 -.0861)^2} = -0.45$$



.0866	.0443	.0482	0	0	.0482	.0443	.0866
.0942	.0463	.0507	0	0	.0507	.0463	.0942
.75	.75	.25	-.25	-.25	-.25	-.25	-.25
22.5	45.0	37.5	30.0	-30.0	32.5	-15.0	-7.50

Panel 1

$$-Q_A = \frac{(.0942 \times 4 - 2)(.0866 \times 22.5 - .75 \times 30)}{2(2 - .0866)2} = 4.56$$

$$-Q_B = \frac{(.75 \times 30 - .0866 \times 22.5)}{2(2 - .0866)} = 5.38$$

$$Q_{R1} = \frac{(.75 \times 30 - .0866 \times 22.5)}{2(2 - .0866)2} = 2.69$$

Panel 2

$$-Q_B = \frac{(.0463 \times 3 - 3)(.0443 \times 45 - .75 \times 30)}{2(2 - .0443)3} = 4.98$$

$$-Q_C = \frac{(.75 \times 30 - .0443 \times 45)}{2(2 - .0443)} = 5.23$$

$$Q_{R2} = \frac{(.75 \times 30 - .0443 \times 45)}{2(2 - .0443)3} = 1.74$$

Panel 3

$$-Q_C = \frac{(.0507 \times 2 - 4)(.0482 \times 37.5 + .25 \times 30)}{2(2 - .0482)4} = -2.33$$

$$-Q_D = \frac{(-.25 \times 30 - .0482 \times 37.5)}{2(2 - .0482)} = -2.38$$

$$Q_{R3} = \frac{(-.25 \times 30 - .0482 \times 37.5)}{2(2 - .0482)4} = -.59$$

Panel 4

$$-Q_D = \frac{-4(0 + .25 \times 30)}{4 \times 4} = -1.87$$

$$-Q_E = \frac{(-.25 \times 30 - 0)}{4} = -1.87$$

$$Q_R = \frac{(-.25 \times 30 - 0)}{4 \times 4} = -.47$$

Note: The only term that changes is $(H_1 L_1 - m M_1)$ and since this is doubled when the load is at panel point 2, it is tripled when the load is at panel point 3, etc. The following constants are derived by multiplying those obtained when the load was at PPl by the factors 2, 3, & 4.

Panel 5

$$-Q_E = -1.88$$

$$-Q_F = -1.88$$

$$Q_{R5} = -.47$$

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Panel 6

$$-Q_G = -1.60$$

$$-Q_F = -1.64$$

$$Q_{R6} = -.41$$

Panel 7

$$-Q_H = -1.67$$

$$-Q_G = -1.75$$

$$Q_{R7} = -0.58$$

Panel 8

$$-Q_I = -1.45$$

$$-Q_H = -1.79$$

$$Q_{R8} = -0.90$$

Load at PP3

Panel 5

$$-Q_E = -2.81$$

$$-Q_F = -2.81$$

$$Q_{R5} = -0.70$$

Panel 6

$$-Q_F = -2.47$$

$$-Q_G = -2.40$$

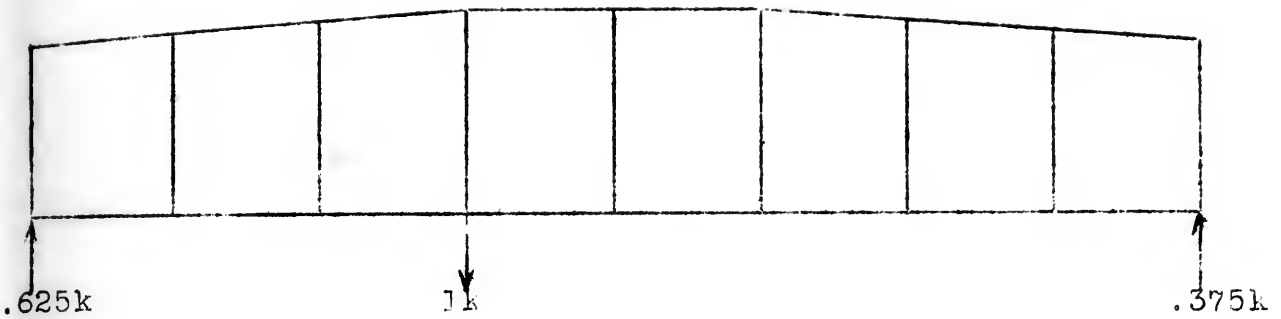
$$Q_{R6} = -0.62$$

Panel 7

$$-Q_G = -2.62$$

$$-Q_H = -2.50$$

$$Q_{R7} = -0.87$$



.0866	.0443	.0482	0	0	.0482	.0443	.0866
.0942	.0463	.0507	0	0	.0507	.0463	.0942
.625	.625	.625	-.375	-.375	-.375	-.375	-.375
18.75	37.5	56.25	45.0	-45.0	-33.75	-22.5	-11.25

Panel 1

Formulae (110f)&(122a) modified by the application of constants for terms involving only M, n, K₁, and K₂. These constants found and checked in solution for two previous loadings.

$$-Q_A = (-.222)(.0866 \times 18.75 - .625 \times 30) = 3.81$$

$$-Q_B = \frac{(.625 \times 30 - .0866 \times 18.75)}{3.82} = 4.49$$

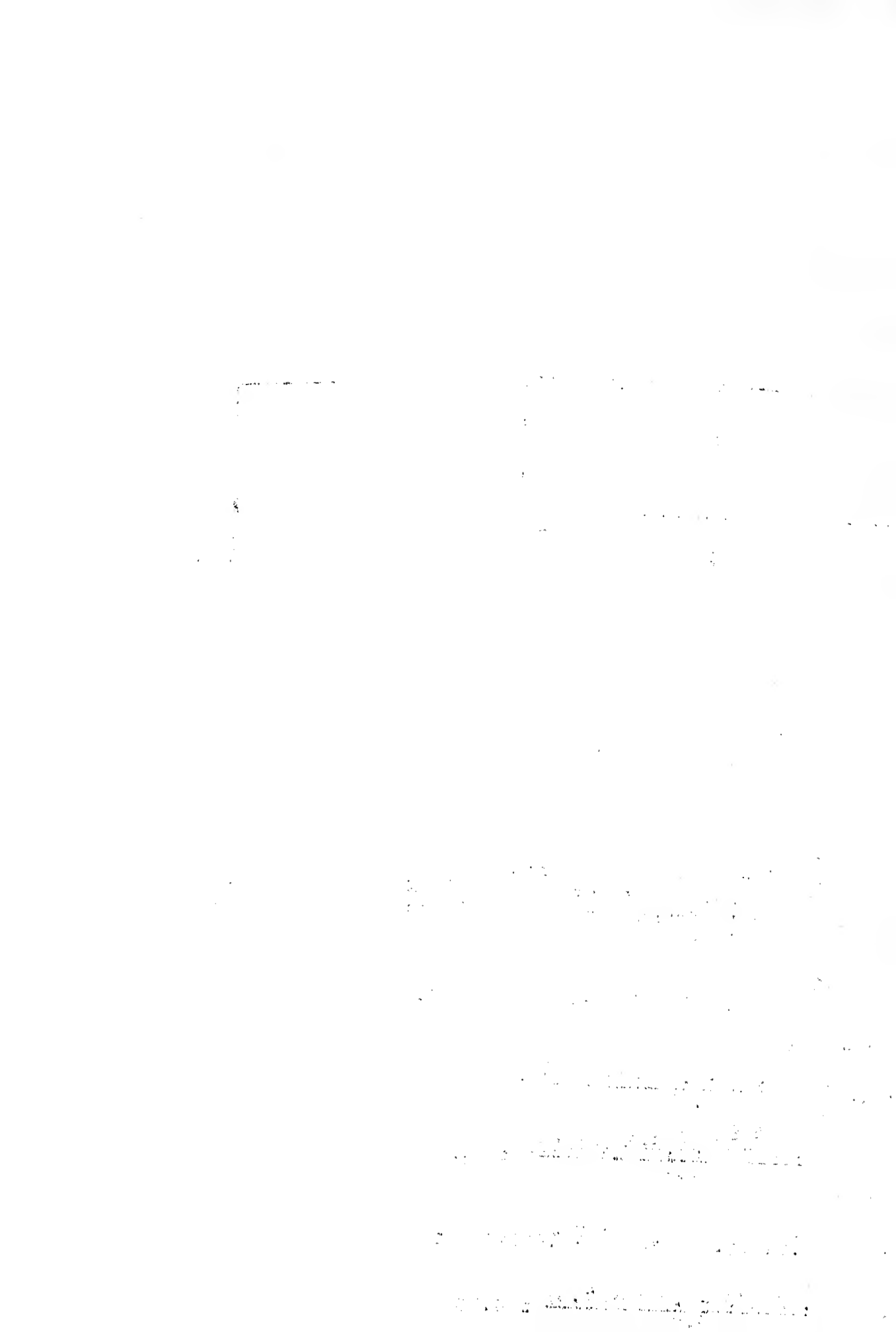
$$Q_{R1} = \frac{(.625 \times 30 - .0482 \times 56.25)}{7.64} = 2.24$$

Panel 2

$$-Q_B = (-.243)(.0443 \times 37.5 - .625 \times 30) = 4.16$$

$$-Q_C = \frac{(.625 \times 30 - .0443 \times 37.5)}{3.92} = 4.36$$

$$Q_{R2} = \frac{(.625 \times 30 - .0443 \times 37.5)}{11.77} = 1.48$$



Panel 3

$$-Q_C = (-.25)(.0482 \times 56.25 - .625 \times 30) = 4.02$$

$$-Q_D = \frac{(.625 \times 30 - .0482 \times 56.25)}{(3.90)} = 4.12$$

$$Q_{R3} = \frac{(.625 \times 30 - .0482 \times 56.25)}{15.60} = 1.03$$

Panel 4

$$-Q_D = (-.25)(0 - .375 \times 30) = -2.81$$

$$-Q_E = \frac{(-.375 \times 30 - 0)}{4} = -2.81$$

$$Q_{R4} = \frac{(-.375 \times 30 - 0)}{4 \times 4} = -.70$$

Panel 5

$$-Q_E = -3.75$$

$$-Q_F = -3.75$$

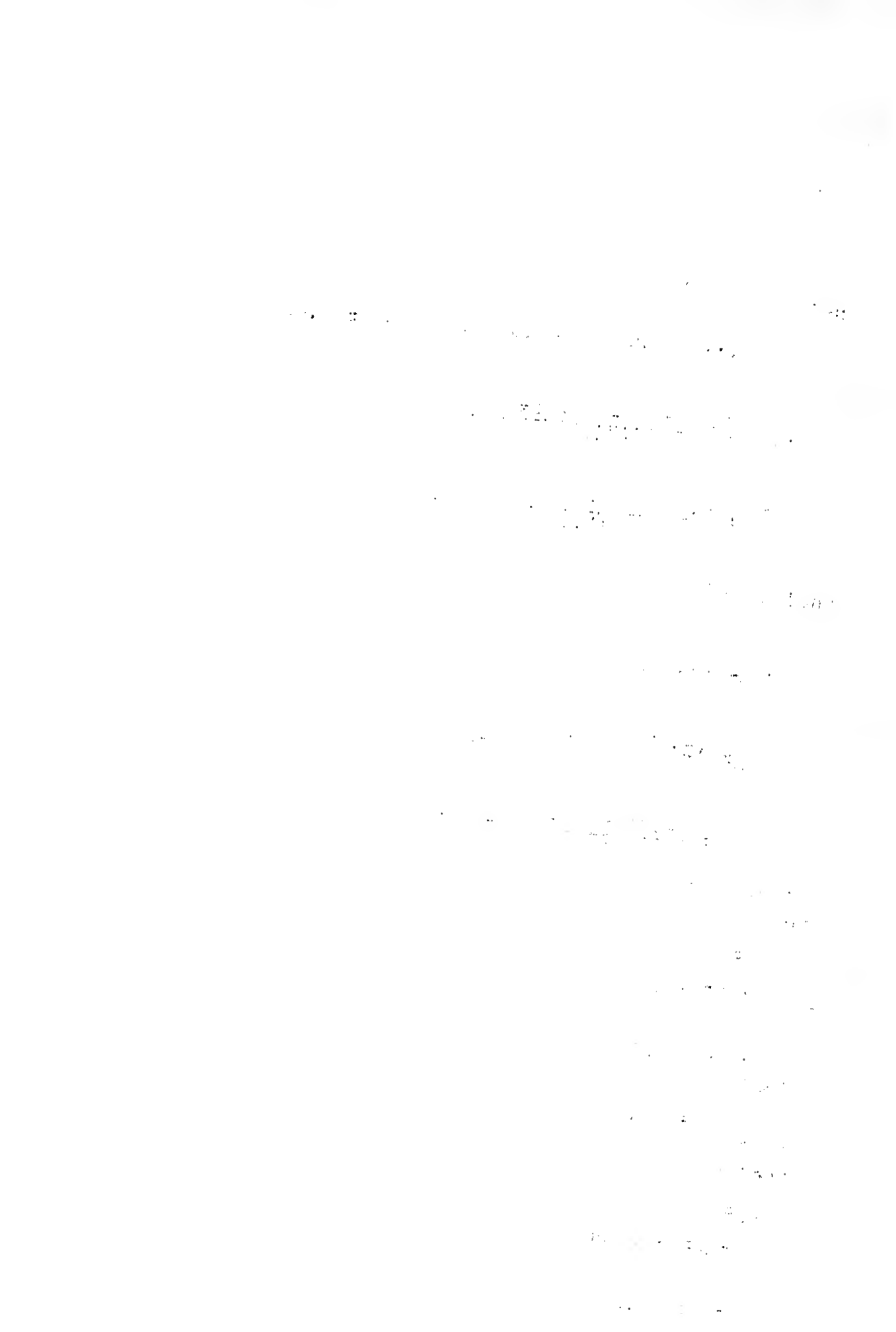
$$Q_{R5} = -0.938$$

Panel 6

$$-Q_F = -3.288$$

$$-Q_G = -3.204$$

$$Q_{R6} = -0.82$$



Panel 7

$$-Q_G = -3.496$$

$$-Q_H = -3.332$$

$$Q_{R7} = -1.164$$

Panel 8

$$-Q_H = -3.584$$

$$-Q_I = -2.908$$

$$Q_{R8} = -1.792$$

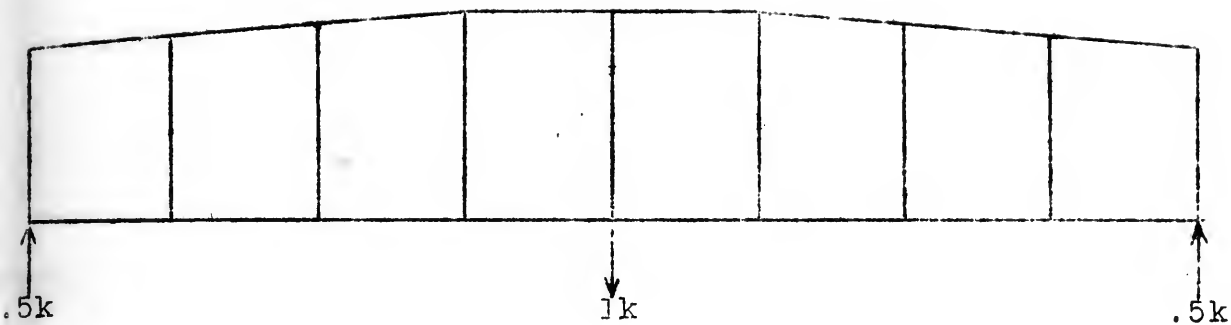
1. The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that this is essential for ensuring the integrity of the financial system and for providing a clear audit trail.

2. The second part of the document outlines the specific procedures for recording transactions. It details the steps involved in the accounting process, from the initial entry of data into the system to the final review and approval of the records.

3. The third part of the document addresses the challenges associated with maintaining accurate records. It identifies common sources of error and provides strategies for minimizing these risks, such as implementing robust internal controls and conducting regular audits.

4. The fourth part of the document discusses the role of technology in improving the accuracy and efficiency of record-keeping. It highlights the benefits of using automated systems and provides examples of how these technologies can be applied in practice.

5. The fifth part of the document concludes by summarizing the key findings and recommendations. It reiterates the importance of accurate record-keeping and provides a clear call to action for all stakeholders involved in the financial system.



.0866	.0482	.0482	0	0	.0482	.0443	.0866
.0942	.0463	.0507	0	0	.0507	.0463	.0942
.5	.5	.5	.5	-.5	-.5	-.5	-.5
15	30	45	60	-60	-45	-30	-15

Panel 1

$$-Q_A = (-.222)(.0866 \times 15 - .5 \times 30) = 3.04$$

$$-Q_B = \frac{(.5 \times 30 - .0866 \times 15)}{3.82} = 3.59$$

$$Q_{R1} = \frac{(.5 \times 30 - .0866 \times 15)}{7.64} = 1.79$$

Panel 2

$$-Q_B = (-.243)(.0443 \times 30 - .5 \times 30) = 3.32$$

$$-Q_C = \frac{(.5 \times 30 - .0443 \times 30)}{3.92} = 3.49$$

$$Q_{R2} = \frac{(.5 \times 30 - .0443 \times 30)}{11.76} = 1.16$$

Panel 3

$$-Q_C = (-.25)(.0482 \times 45 - .5 \times 30) = 3.21$$

$$-Q_D = \left(\frac{.5 \times 30 - .0482 \times 45}{3.90} \right) = 3.30$$

$$Q_{R3} = \left(\frac{.5 \times 30 - .0482 \times 45}{15.60} \right) = .82$$

Panel 4

$$-Q_D = (-.25)(0 - .5 \times 30) = 3.75$$

$$-Q_E = \left(\frac{.5 \times 30 - 0}{4} \right) = 3.75$$

$$Q_{R4} = \left(\frac{.5 \times 30 - 0}{4 \times 4} \right) = .94$$

Panel 5

$$-Q_E = -2.31$$

$$-Q_F = -2.81$$

$$Q_{R5} = -0.70$$

Panel 6

$$-Q_F = -2.47$$

$$-Q_G = -2.40$$

$$Q_{R6} = -0.62$$

Panel 7

$$-Q_G = -2.62$$

$$-Q_H = -2.50$$

$$Q_{R7} = -0.87$$

Panel 8

$$-Q_H = -2.18$$

$$-Q_I = -2.67$$

$$Q_{R8} = -1.34$$

1000 - 1000000 - 1000000 - 1000000

[Illegible handwritten signature]

1. The first step in the process is to identify the problem or issue that needs to be addressed. This involves gathering information and understanding the context of the problem.

..

Figure 1. The effect of the concentration of the *Agrobacterium* suspension on the transformation efficiency of *Agrobacterium* strains. The concentration of the *Agrobacterium* suspension was 10⁶ cells/ml (○), 10⁷ cells/ml (□), 10⁸ cells/ml (△), 10⁹ cells/ml (◇), and 10¹⁰ cells/ml (●). The error bars represent the standard deviation of three independent experiments.

Figure 1 shows a 2D hexagonal lattice of atoms. A central atom is labeled '1'. It is surrounded by six atoms in a hexagonal arrangement, labeled '2' through '7'. The distance between the central atom and its nearest neighbors is labeled 'a'. The distance between two adjacent atoms in the second shell is labeled 'b'. The diagram illustrates the geometry of the lattice and the definition of the parameters a and b .

Trial	Control (n=10)	MCI (n=10)	AD (n=10)
1	95	85	75
2	95	85	75
3	95	80	70
4	95	75	65
5	95	75	65

[illegible]

Number of hauls	<i>A. balearicum</i> (%)	<i>A. balearicum</i> + <i>A. balearicum</i> + <i>A. balearicum</i> (%)
1	100	0
2	50	50
3	33	67
4	25	75
5	20	80
6	17	83
7	14	86
8	12	88
9	11	89
10	10	90

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300. 301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. 397. 398. 399. 400. 401. 402. 403. 404. 405. 406. 407. 408. 409. 410. 411. 412. 413. 414. 415. 416. 417. 418. 419. 420. 421. 422. 423. 424. 425. 426. 427. 428. 429. 430. 431. 432. 433. 434. 435. 436. 437. 438. 439. 440. 441. 442. 443. 444. 445. 446. 447. 448. 449. 450. 451. 452. 453. 454. 455. 456. 457. 458. 459. 460. 461. 462. 463. 464. 465. 466. 467. 468. 469. 470. 471. 472. 473. 474. 475. 476. 477. 478. 479. 480. 481. 482. 483. 484. 485. 486. 487. 488. 489. 490. 491. 492. 493. 494. 495. 496. 497. 498. 499. 500. 501. 502. 503. 504. 505. 506. 507. 508. 509. 510. 511. 512. 513. 514. 515. 516. 517. 518. 519. 520. 521. 522. 523. 524. 525. 526. 527. 528. 529. 530. 531. 532. 533. 534. 535. 536. 537. 538. 539. 540. 541. 542. 543. 544. 545. 546. 547. 548. 549. 550. 551. 552. 553. 554. 555. 556. 557. 558. 559. 560. 561. 562. 563. 564. 565. 566. 567. 568. 569. 570. 571. 572. 573. 574. 575. 576. 577. 578. 579. 580. 581. 582. 583. 584. 585. 586. 587. 588. 589. 590. 591. 592. 593. 594. 595. 596. 597. 598. 599. 600. 601. 602. 603. 604. 605. 606. 607. 608. 609. 610. 611. 612. 613. 614. 615. 616. 617. 618. 619. 620. 621. 622. 623. 624. 625. 626. 627. 628. 629. 630. 631. 632. 633. 634. 635. 636. 637. 638. 639. 640. 641. 642. 643. 644. 645. 646. 647. 648. 649. 650. 651. 652. 653. 654. 655. 656. 657. 658. 659. 660. 661. 662. 663. 664. 665. 666. 667. 668. 669. 670. 671. 672. 673. 674. 675. 676. 677. 678. 679. 680. 681. 682. 683. 684. 685. 686. 687. 688. 689. 690. 691. 692. 693. 694. 695. 696. 697. 698. 699. 700. 701. 702. 703. 704. 705. 706. 707. 708. 709. 710. 711. 712. 713. 714. 715. 716. 717. 718. 719. 720. 721. 722. 723. 724. 725. 726. 727. 728. 729. 730. 731. 732. 733. 734. 735. 736. 737. 738. 739. 740. 741. 742. 743. 744. 745. 746. 747. 748. 749. 750. 751. 752. 753. 754. 755. 756. 757. 758. 759. 760. 761. 762. 763. 764. 765. 766. 767. 768. 769. 770. 771. 772. 773. 774. 775. 776. 777. 778. 779. 780. 781. 782. 783. 784. 785. 786. 787. 788. 789. 790. 791. 792. 793. 794. 795. 796. 797. 798. 799. 800. 801. 802. 803. 804. 805. 806. 807. 808. 809. 810. 811. 812. 813. 814. 815. 816. 817. 818. 819. 820. 821. 822. 823. 824. 825. 826. 827. 828. 829. 830. 831. 832. 833. 834. 835. 836. 837. 838. 839. 840. 84

| Age Group | Total (%) | Female (%) | Male (%) | Unknown (%) |
|-----------|-----------|------------|----------|-------------|
| 18-24 | ~10 | ~8 | ~6 | ~4 |
| 25-34 | ~15 | ~12 | ~10 | ~8 |
| 35-44 | ~20 | ~18 | ~16 | ~14 |
| 45-54 | ~25 | ~22 | ~20 | ~18 |
| 55-64 | ~30 | ~28 | ~26 | ~24 |
| 65+ | ~35 | ~32 | ~30 | ~28 |

Figure 1 is a line graph showing the percentage of total sample for each age group (0-14, 15-24, 25-34, 35-44, 45-54, 55-64, 65-74, 75+) across different years. The Y-axis is 'PERCENTAGE OF TOTAL SAMPLE' (0-100). The X-axis is 'AGE GROUP' (0-14, 15-24, 25-34, 35-44, 45-54, 55-64, 65-74, 75+). The legend indicates: 1970 (solid line), 1980 (dashed line), 1990 (dotted line), 2000 (dash-dot line), 2010 (long dashed line), 2020 (short dashed line), 2030 (dotted line), 2040 (dash-dot line), 2050 (long dashed line), 2060 (short dashed line), 2070 (dotted line), 2080 (dash-dot line), 2090 (long dashed line), 2100 (short dashed line). The graph shows a significant shift in the population structure over time, with a large increase in the 0-14 age group starting around 2030 and peaking around 2060, and a corresponding decrease in the 15-24 age group.

| Condition | Control (n=10) | MCI (n=10) | AD (n=10) |
|-----------|----------------|------------|-----------|
| 1 | ~95 | ~85 | ~75 |
| 2 | ~90 | ~80 | ~70 |
| 3 | ~85 | ~75 | ~65 |
| 4 | ~85 | ~75 | ~65 |

1941

100

1. *Chlorophyll a* and *Chlorophyll b* were determined by the method of Lichtenthaler and Sponholz (1980). The total chlorophyll content was determined by the method of Arar and Cook (1980). The carotenoid content was determined by the method of Lichtenthaler and Sponholz (1980). The total carotenoid content was determined by the method of Lichtenthaler and Sponholz (1980). The total carotenoid content was determined by the method of Lichtenthaler and Sponholz (1980).

100

100

100

INFLUENCE LINES - JOINT CONSTANTS

LOAD AT B

Panel 1

$$\left[1.5x4 + 2 + \frac{(3-.0866)(.0942x4-2)}{2(2-.0866)} \right] A + \left[1 + \frac{(3-.17)(.0942x4-2)}{2(2-.0866)} \right] B = -Q$$

$$6.77A - .25B = 5.32$$

$$\left[2 + 1.5 \times 3 - \frac{(3-.17)2}{2(2-.0866)} \right] B + \left[\frac{2}{3} - \frac{(3-.0866)2}{2(2-.0866)} \right] A = -Q_B$$

$$5.02B - .52A = 6.27$$

Solving Simultaneously

$$A = 0.82$$

$$B = 1.33$$

$$R_1 = \frac{(3-.0866).82 + (3-.17)1.33 + 3.14}{2(2-.0866)} = 4.76$$

Panel 2

$$\left[1.5x3 + 3 + \frac{(3-.0443)(.0463x3-3)}{2(2-.0443)} \right] B + \left[\frac{3}{2} + \frac{(3-.09)(.0463x3-3)}{2(2-.0443)} \right] C = -Q_B$$

$$5.34B - .62C = -1.16$$

$$\left[3 + 1.5x2 - \frac{(3-.0886)3}{2(2-.0443)} \right] C + \left[\frac{3}{2} - \frac{(3-.0443)3}{2(2-.0443)} \right] B = -Q_C$$

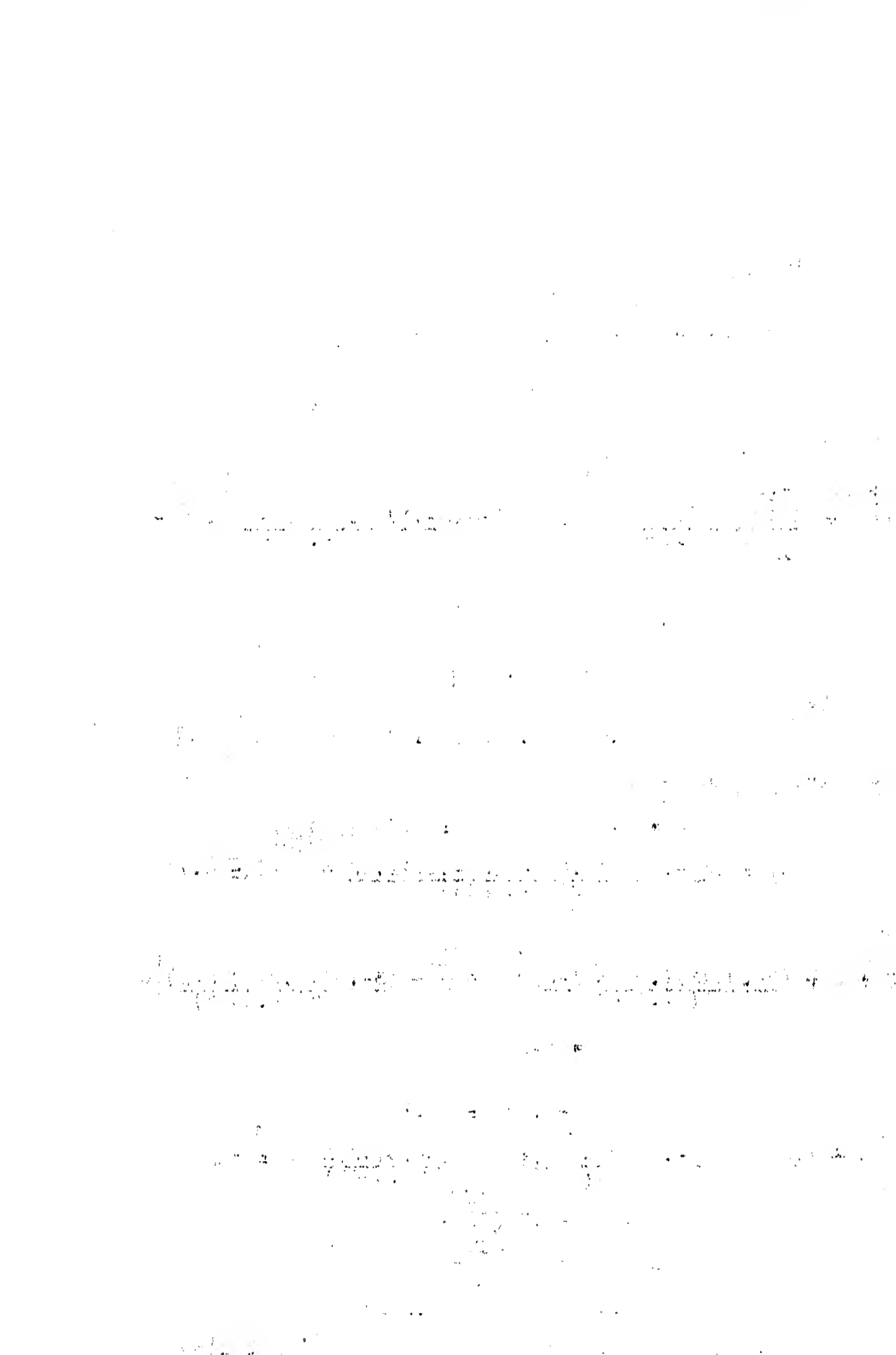
$$3.77C - .76B = -1.21$$

Solving Simultaneously

$$B = -.26$$

$$C = -.37$$

$$R_2 = \frac{(3-.0443)(-.26) + (3-.09)(-.37) - .40}{2(2-.0443)} = -.87$$



Panel 3

$$\left[1.5x2 + 4 + \frac{(3 - .0482)(.0507x2 - 4)}{2(2 - .0482)} \right] C + \left[2 + \frac{(3 - .0964)(.0507x2 - 4)}{2(2 - .0482)} \right] D = -Q_C$$

$$4.05 C - .9 D = -1.16$$

$$\left[4 + 1.5 - \frac{(3 - .0964)4}{2(2 - .0482)} \right] D + \left[2 - \frac{(3 - .0482)4}{2(2 - .0482)} \right] C = -Q_D$$

$$2.53 D - 1.02 C = 1.19$$

Solving Simultaneously

$$\begin{aligned} C &= -.43 \\ D &= -.64 \end{aligned}$$

$$R_3 = \frac{(3 - .0482)(-.43) + (3 - .0964)(-.64)}{2(2 - .0482)} - .30 = -1.10$$

Panel 4

$$\left[1.5x1 + 4 + \frac{3(-4)}{4} \right] D + \left[2 + \frac{3(-4)}{4} \right] E = -Q_D$$

$$2.5 D - 1 E = -.94$$

$$\left[4 + 1.5x1 - \frac{3x4}{4} \right] E + \left[2 - \frac{3x4}{4} \right] D = -Q_E$$

$$2.5 E - 1 D = -.94$$

Solving Simultaneously

$$\begin{aligned} D &= -.63 \\ E &= -.63 \end{aligned}$$

$$R_4 = \frac{3(-.63) + 3(-.63)}{4} - .23 = -1.18$$

Panel 5

$$\left[1.5 \times 1 + \frac{4}{4} \right] F - \frac{4}{4} E = -.94$$

$$\left[1.5 \times 1 + \frac{4}{4} \right] E - \frac{4}{4} F = -.94$$

$$E = -.63$$

$$F = -.63$$

$$R_5 = \frac{3}{4} (-.63 - .63) - .23 = -.94 - .23 = -1.17$$

Panel 6

$$\left[1.5 \times 2 + 4 + \frac{(3 - .0482)(.0507 \times 2 - 4)}{2(2 - .0482)} \right] G$$

$$+ \left[\frac{4}{2} + \frac{(3 - 2 \times .0482)(.0507 \times 2 - 4)}{2(2 - .0482)} \right] F = -.80$$

$$4.06 G - 0.89 F = -.80$$

$$\left[4 + 1.5 \times 1 - \frac{(3 - 2 \times .0482)4}{2(2 - .0482)} \right] F + \left[\frac{4}{2} - \frac{(3 - .0482)4}{2(2 - .0482)} \right] G = -.82$$

$$2.53 F - 1.02 G = -.82$$

Solving Simultaneously

$$F = -.47$$

$$G = -.30$$

$$R_6 = \frac{-(3 - .0482) \times .30 - (3 - 2 \times .0482) \times .47}{2(2 - .0482)} - .21 = -.78$$

THE UNIVERSITY OF CHICAGO
DIVISION OF THE PHYSICAL SCIENCES
DEPARTMENT OF PHYSICS

PHYSICS 551 - QUANTUM MECHANICS
LECTURE 10 - SCATTERING THEORY

PROFESSOR J. J. KATZ
LECTURER: DR. J. J. KATZ

DATE: MARCH 10, 1964
PLACE: CHICAGO, ILLINOIS

TOPIC: SCATTERING THEORY
SUBJECT: QUANTUM MECHANICS

LECTURE 10 - SCATTERING THEORY
PART I: THE SCATTERING CROSS SECTION

1. INTRODUCTION

2. THE SCATTERING CROSS SECTION
3. THE DIFFERENTIAL SCATTERING CROSS SECTION

Panel 7

$$\left[1.5 \times 3 + 3 + \frac{(3-.0443)(.0463 \times 3 - 3)}{2(2-.0443)} \right] H$$

$$+ \left[\frac{3}{2} + \frac{(3-2 \times .0443)(.0463 \times 3 - 3)}{2(2-.0443)} \right] G = -0.83$$

$$5.34 H - .62 G = -.83$$

$$\left[3 + 1.5 \times 2 - \frac{(3-2 \times .0443)3}{2(2-.0443)} \right] G + \left[\frac{3}{2} - \frac{(3-.0433)3}{2(2-.0433)} \right] H = -.87$$

$$3.77 G - .76 H = -.87$$

Solving Simultaneously

$$G = -.27$$

$$H = -.19$$

$$R_7 = - \frac{(3-.0443) \times .19 + (3-2 \times .0443) \times -.27}{2(2-.0443)} - 0.29 = -.63$$

Panel 8

$$\left[1.5 \times 4 + 2 + \frac{(3-.0866)(.0942 \times 4 - 2)}{2(2-.0866)} \right] I + \left[\frac{2}{2} + \frac{(3-2 \times .0866)(.0942 \times 4 - 2)}{2(2-.0866)} \right] H$$

$$= -.73$$

$$6.77 I - .20 H = -.73$$

$$\left[2 + 1.5 \times 3 - \frac{(3-2 \times .0866)2}{2(2-.0866)} \right] H + \left[\frac{2}{2} - \frac{(3-.0866)2}{2(2-.0866)} \right] I$$

$$5.02 H - .52 I = -.49$$

Solving Simultaneously

$$H = -0.21$$

$$I = -0.11$$

$$R_8 = - \frac{(3-.0866) \times .11 - (3-2 \times .0866) \times -.21}{2(2-.0861)} - 0.49 = .73$$

THE UNIVERSITY OF CHICAGO

PHYSICS DEPARTMENT

LECTURE NOTES

PHYSICS 354: QUANTUM MECHANICS

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PHYSICS 354: QUANTUM MECHANICS

Influence Lines - Joint Constants

Load at C

Panel 1

$$6.77A - .2 B = 4.56$$

$$-.52A + 5.02B = 5.38$$

Solving Simultaneously

$$A = .71$$

$$B = 1.14$$

$$R_1 = \frac{(3 - .0866).71 + (3 - .17)1.14}{2(2 - .0866)} + 2.69 = 4.07$$

Panel 2

$$5.34B - .62C = 4.98$$

$$3.77C - .76B = 5.23$$

Solving Simultaneously

$$B = 1.14$$

$$C = 1.62$$

$$R_2 = \frac{(3 - .0443)B + (3 - .0886)C}{2(2 - .0443)} + 1.76 = 3.80$$

Panel 3

$$4.05C - .9 D = -2.23$$

$$2.53D - 1.02C = -1.19$$

Solving Simultaneously

$$C = -.72$$

$$D = -.76$$

$$R_3 = \frac{(3 - .0482)(-.72) + (3 - .0964)(-.76)}{2(2 - .0482)} - .59 = -1.70$$

Panel 4

$$2.5D - 1E = -1.87$$

$$2.5E - 1D = -1.87$$

Solving Simultaneously

$$D = -1.25$$

$$E = -1.25$$

$$R_4 = \frac{3(-1.25) + 3(-1.25)}{4} - .47 = -2.34$$

Panel 5

$$E = -1.25$$

$$F = -1.25$$

$$R_5 = -2.34$$

Panel 6

$$F = -0.94$$

$$G = -0.60$$

$$R_6 = -1.56$$

Panel 7

$$G = -0.54$$

$$H = -0.37$$

$$R_7 = -1.27$$

Panel 8

$$H = -0.41$$

$$I = -0.23$$

$$R_8 = -1.45$$

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 40. $\frac{1}{2} \log \frac{1}{2}$

Influence Lines - Joint Constants

Load at D

Panel 1

$$6.77A - .2 B = 3.81$$

$$-.52A + 5.02B = 4.49$$

Solving Simultaneously

$$A = .59$$

$$B = .96$$

$$R_1 = \frac{(3 - .0866).59 + (3 - .17).96}{2(2 - .0866)} + 2.24 = 3.40$$

Panel 2

$$5.34B - .62C = 4.16$$

$$3.77C - .76B = 4.36$$

Solving Simultaneously

$$B = .94$$

$$C = 1.34$$

$$R_2 = \frac{(3 - .0443)B + (3 - .0886)C}{2(2 - .0443)} + 1.48 = 3.18$$

Panel 3

$$4.05C - .9D = 4.02$$

$$2.53D - 1.02C = 4.12$$

Solving Simultaneously

$$C = 1.49$$

$$D = 2.23$$

$$R_3 = \frac{(3 - .0482)1.49 + (3 - .0964)2.23}{2(2 - .0482)} + 1.03 = 3.81$$

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Panel 4

$$2.5D - 1E = -2.81$$

$$2.5E - 1D = -2.81$$

Solving Simultaneously

$$D = -1.87$$

$$E = -1.87$$

$$R_4 = \frac{3(-1.87) + 3(-1.87)}{4} + .70 = -3.51$$

Panel 5

$$E = -1.88$$

$$F = -1.88$$

$$R_5 = -3.52$$

Panel 6

$$F = -1.41$$

$$G = -0.90$$

$$R_6 = -2.34$$

Panel 7

$$G = -0.81$$

$$H = -0.56$$

$$R_7 = -1.90$$

Panel 8

$$H = -0.62$$

$$I = -0.34$$

$$R_8 = -2.18$$

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1771

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1782

1783

Influence Lines - Joint Constants

Load at E

Panel 1

$$6.77A - .2B = 3.04$$

$$-.52A + 5.02B = 3.59$$

Solving Simultaneously

$$A = .47$$

$$B = .76$$

$$R_1 = \frac{(3 - .0866).47 + (3 - .17).76}{2(2 - .0866)} + 1.79 = 2.71$$

Panel 2

$$5.34B - .62C = 3.32$$

$$3.77C - .76B = 3.49$$

Solving Simultaneously

$$B = .75$$

$$C = 1.08$$

$$R_2 = \frac{(3 - .0443)B + (3 - .0866)C}{2(2 - .0433)} + 1.16 = 2.53$$

Panel 3

$$4.05C - .9D = 3.21$$

$$2.53D - 1.02C = 3.30$$

Solving Simultaneously

$$C = 1.19$$

$$D = 1.78$$

$$R_3 = \frac{(3 - .0482)1.19 + (3 - .0964)1.78}{2(2 - .0482)} + .82 = 3.04$$

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Panel 4

$$2.5D - 1E = 3.75$$

$$2.5E - 1D = 3.75$$

Solving Simultaneously

$$D = 2.5$$

$$E = 2.5$$

$$R_4 = \frac{3(2.5) + 3(2.5)}{4} + .94 = 4.69$$

Panel 5

$$E = -2.50$$

$$F = -2.50$$

$$R_5 = -4.69$$

Panel 6

$$F = -1.88$$

$$G = -1.20$$

$$R_6 = -3.12$$

Panel 7

$$G = -1.08$$

$$H = -.75$$

$$R_7 = 2.53$$

Panel 8

$$H = -.83$$

$$I = -.45$$

$$R_8 = -2.91$$

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Influence Lines - Moment Determination

Load at B

Panel 1

$$M_{AB} = 2\left(.82 + \frac{1.33}{2} - 4.76\right) = -6.56$$

$$M_{BA} = 2\left(1.33 + \frac{.82}{2} - 4.76\right) = -6.04$$

Panel 2

$$M_{BC} = 3\left(-.26 - \frac{.37}{2} + .87\right) = +1.29$$

$$M_{CB} = 3\left(-.37 - \frac{.26}{2} + .87\right) = +1.11$$

Panel 3

$$M_{CD} = 4\left(-.43 - \frac{.64}{2} + 1.10\right) = +1.40$$

$$M_{DC} = 4\left(-.64 - \frac{.43}{2} + 1.10\right) = +1.10$$

Panel 4

$$M_{DE} = 4\left(-.63 - \frac{.63}{2} + 1.18\right) = +.96$$

$$M_{ED} = 4\left(-.63 - \frac{.63}{2} + 1.18\right) = +.96$$

Panel 5

$$M_{EF} = 4\left(-.63 - \frac{.63}{2} + 1.17\right) = +0.94$$

$$M_{FE} = 4\left(-.63 - \frac{.63}{2} + 1.17\right) = +0.94$$

1. The first part of the paper is devoted to the study of the properties of the function $f(x)$ defined by the equation

$$f(x) = \int_0^x \frac{1}{1+t^2} dt, \quad (1)$$

$$f(x) = \int_0^x \frac{1}{1+t^2} dt, \quad (2)$$

$$f(x) = \int_0^x \frac{1}{1+t^2} dt, \quad (3)$$

$$f(x) = \int_0^x \frac{1}{1+t^2} dt, \quad (4)$$

$$f(x) = \int_0^x \frac{1}{1+t^2} dt, \quad (5)$$

$$f(x) = \int_0^x \frac{1}{1+t^2} dt, \quad (6)$$

$$f(x) = \int_0^x \frac{1}{1+t^2} dt, \quad (7)$$

$$f(x) = \int_0^x \frac{1}{1+t^2} dt, \quad (8)$$

$$f(x) = \int_0^x \frac{1}{1+t^2} dt, \quad (9)$$

$$f(x) = \int_0^x \frac{1}{1+t^2} dt, \quad (10)$$

Panel 6

$$M_{FG} = 4(-.47 - \frac{.30}{2} + .78) = +0.64$$

$$M_{GF} = 4(-.30 - \frac{.47}{2} + .78) = +0.98$$

Panel 7

$$M_{GH} = 3(-.27 - \frac{.19}{2} + 0.63) = +0.81$$

$$M_{HG} = 3(-.19 - \frac{.27}{2} + 0.63) = +0.93$$

Panel 8

$$M_{HI} = 2(-.207 - \frac{.113}{2} + 0.727) = +0.93$$

$$M_{IH} = 2(-.113 - \frac{.207}{2} + 0.727) = +1.02$$

Influence Lines - Moment Determination

Load at C

Panel 1

$$M_{AB} = 2\left(\cancel{.71} + \frac{1.14}{2} - 4.07\right) = -5.58$$

$$M_{BA} = 2\left(1.14 + \frac{\cancel{.71}}{2} - 4.07\right) = -5.16$$

Panel 2

$$M_{BC} = 3\left(1.14 + \frac{1.62}{2} - 3.80\right) = -5.55$$

$$M_{CB} = 3\left(1.62 + \frac{1.14}{2} - 3.80\right) = -4.83$$

Panel 3

$$M_{CD} = 4\left(-.72 - \frac{.76}{2} + 1.70\right) = \cancel{+}2.40$$

$$M_{DC} = 4\left(-.76 - \frac{.72}{2} + 1.70\right) = \cancel{+}2.32$$

Panel 4

$$M_{DE} = 4\left(-1.25 - \frac{1.25}{2} + 2.34\right) = \cancel{+}1.88$$

$$M_{ED} = 4\left(-1.25 - \frac{1.25}{2} + 2.34\right) = \cancel{+}1.88$$

Panel 5

$$M_{EF} = 1.88$$

$$M_{FE} = 1.88$$

Panel 6

$$M_{FG} = 1.29$$

$$M_{GF} = 1.96$$

Panel 7

$$M_{GH} = 1.62$$

$$M_{HG} = 1.87$$

Panel 8

$$M_{HI} = 1.85$$

$$M_{IH} = 2.04$$

Influence Lines - Moment Determination

Load at D

Panel 1

$$M_{AB} = 2(.59 + \frac{.96}{2} - 3.40) = -4.66$$

$$M_{BA} = 2(.96 + \frac{.59}{2} - 3.40) = -4.30$$

Panel 2

$$M_{BC} = 3(.94 + \frac{1.34}{2} - 3.18) = -4.71$$

$$M_{CB} = 3(1.34 + \frac{.94}{2} - 3.18) = -4.11$$

Panel 3

$$M_{CD} = 4(1.49 + \frac{2.23}{2} - 3.81) = -4.84$$

$$M_{DC} = 4(2.23 + \frac{1.49}{2} - 3.81) = -3.36$$

Panel 4

$$M_{DE} = 4(-1.87 - \frac{1.87}{2} + 3.51) = +2.84$$

$$M_{ED} = 4(-1.87 - \frac{1.87}{2} + 3.51) = +2.84$$

Panel 5

$$M_{EF} = 2.81$$

$$M_{FE} = 2.81$$

Panel 6

$$M_{FG} = 1.93$$

$$M_{GF} = 2.94$$

Panel 7

$$M_{GH} = 2.43$$

$$M_{HG} = 2.80$$

Panel 8

$$M_{HI} = 2.78$$

$$M_{IH} = 3.06$$

• *Chlorophyll a* (Chl a) is the primary photosynthetic pigment in all photosynthetic organisms. It is a green pigment that absorbs light energy in the blue and red regions of the visible spectrum. Chl a is found in the thylakoid membranes of chloroplasts in plants and in the plasma membrane of cyanobacteria and algae.

Influence Lines - Moment Determination

Load at E

Panel 1

$$M_{AB} = 2(.47 + \frac{.76}{2} - 2.79) = -3.88$$

$$M_{BA} = 2(.76 + \frac{.47}{2} - 2.79) = -3.60$$

Panel 2

$$M_{BC} = 3(.75 + \frac{1.08}{2} - 2.53) = -3.72$$

$$M_{CB} = 3(1.08 + \frac{.75}{2} - 2.53) = -3.24$$

Panel 3

$$M_{CD} = 4(1.19 + \frac{1.78}{2} - 3.04) = -3.84$$

$$M_{DC} = 4(1.78 + \frac{1.19}{2} - 3.04) = -2.68$$

Panel 4

$$M_{DE} = 4(2.5 + \frac{2.5}{2} - 4.69) = -3.76$$

$$M_{ED} = 4(2.5 + \frac{2.5}{2} - 4.69) = -3.76$$

Panel 5

$$M_{EF} = 3.75$$

$$M_{FE} = 3.75$$

Panel 6

$$M_{FG} = 2.58$$

$$M_{GF} = 3.92$$

Panel 7

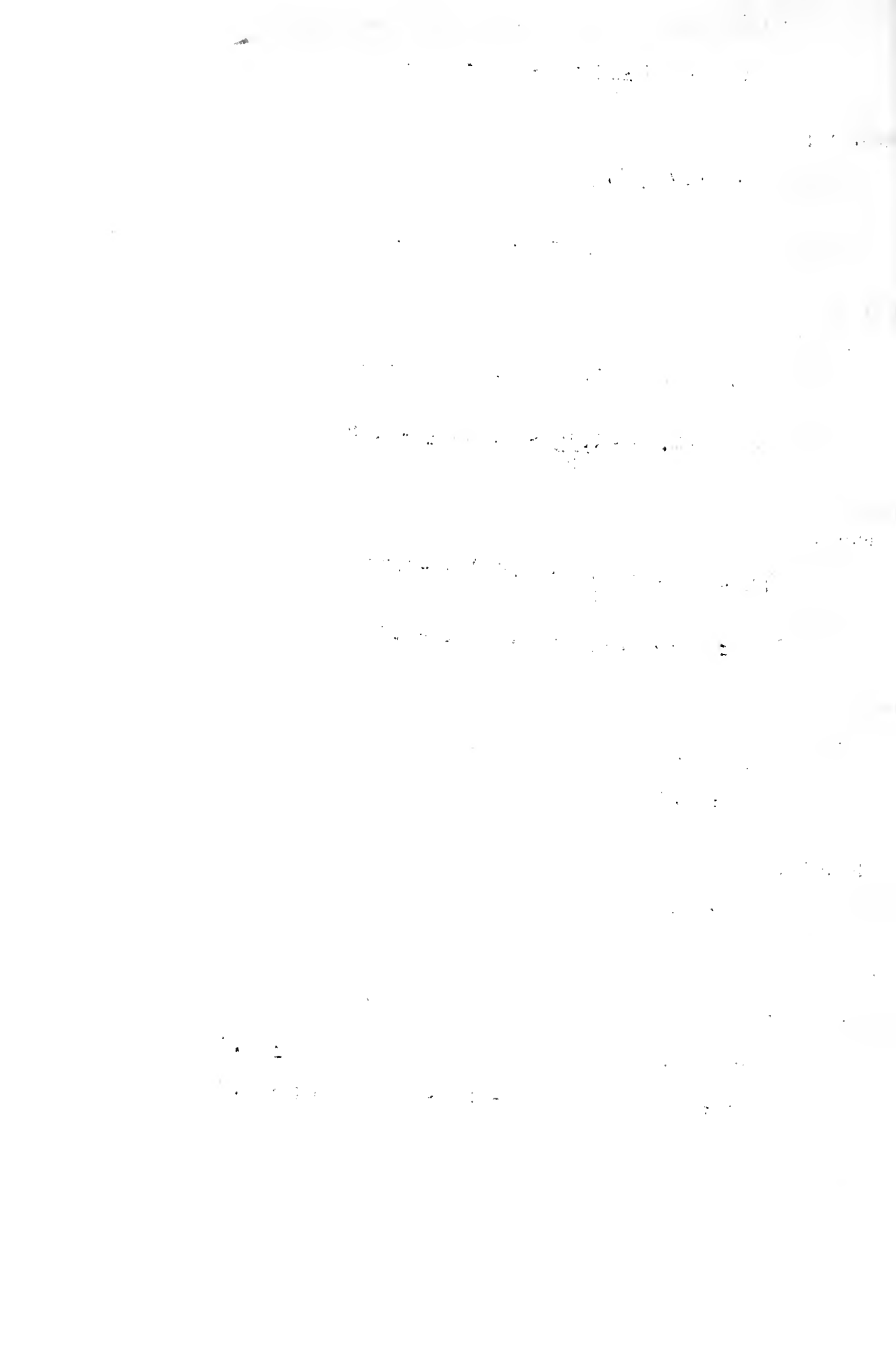
$$M_{GH} = 3.24$$

$$M_{HG} = 3.73$$

Panel 8

$$M_{HI} = 3.60$$

$$M_{IH} = 4.08$$



First Moment Corrections - Load at B

Panel 1

$$6.77A - .20B = 0 \quad A = -.01$$

$$-0.52A + 5.02B = -1.29 \quad B = -.25$$

$$R_1 = \frac{-2.91 \times .01 - 2.83 \times .25}{3.83} = -.19$$

$$M_{AB} = 2(-.01 - \frac{.25}{2} + .19) = .12$$

$$M_{BA} = 2(-.25 - \frac{.01}{2} + .19) = -.12$$

Panel 2

$$5.34B - .63C = 6.04 \quad B = 1.11$$

$$-0.77B + 3.77C = -1.40 \quad C = -0.14$$

$$R_2 = \frac{2.96 \times 1.11 - 2.91 \times .14}{3.91} = .74$$

$$M_{BC} = 2(1.11 - \frac{.14}{2} + 0.74) = .60$$

$$M_{CB} = 2(-.14 + \frac{1.11}{2} + 0.74) = -.64$$

Panel 3

$$4.06C - .89D = -1.11 \quad C = -.39$$

$$-1.02C + 2.53D = -.96 \quad D = -.54$$

$$R_3 = \frac{-2.95 \times .39 - 2.90 \times .54}{3.90} = -.70$$

$$M_{CD} = 3(-.39 - \frac{.54}{2} + .70) = .12$$

$$M_{DC} = 3(-.54 - \frac{.39}{2} + .70) = -.12$$

Panel 4

$$\begin{aligned} 2.5 D - E &= -1.10 \\ -0 + 2.5 E &= -.96 \\ D &= -.71 \\ E &= -.67 \end{aligned}$$

$$\begin{aligned} R_4 &= \frac{3}{4} (-.67 - .71) = -1.03 \\ M_{DE} &= 4(-.71 - \frac{.67}{2} + 1.03) = -.08 \\ M_{ED} &= 4(-.67 - \frac{.71}{2} + 1.03) = .04 \end{aligned}$$

Panel 5

$$\begin{aligned} 2.5 E - F &= -.64 \\ -E + 2.5 F &= -.96 \\ E &= -.49 \\ F &= -.58 \end{aligned}$$

$$\begin{aligned} R_5 &= \frac{3}{4} (-.58 - .49) = -.80 \\ M_{EF} &= 4(-.49 - \frac{.58}{2} + .80) = .08 \\ M_{FE} &= 4(-.58 - \frac{.49}{2} + .80) = -.12 \end{aligned}$$

Panel 6

$$\begin{aligned} 4.06 - 0.89 F &= -.81 \\ -1.026 + 2.53 F &= -.96 \\ F &= -.50 \\ G &= -.31 \end{aligned}$$

$$\begin{aligned} R_6 &= \frac{-2.95 \times .31 - 2.90 \times .50}{3.90} = -.61 \\ M_{FG} &= 3(-.50 - \frac{.31}{2} + .61) = -.15 \\ M_{GF} &= 3(-.31 - \frac{.50}{2} + .61) = .15 \end{aligned}$$

1. The first part of the paper discusses the importance of the study of the history of the United States. It is argued that a knowledge of the past is essential for a full understanding of the present and for the development of a sound policy for the future.

2. The second part of the paper discusses the role of the individual in the history of the United States. It is argued that the actions of individuals have played a major role in the development of the country and that it is important to study the lives of the great men of the past.

3. The third part of the paper discusses the role of the government in the history of the United States. It is argued that the government has played a major role in the development of the country and that it is important to study the actions of the government in the past.

4. The fourth part of the paper discusses the role of the people in the history of the United States. It is argued that the actions of the people have played a major role in the development of the country and that it is important to study the actions of the people in the past.

5. The fifth part of the paper discusses the role of the future in the history of the United States. It is argued that the future is important for the development of the country and that it is important to study the future in the past.

6. The sixth part of the paper discusses the role of the present in the history of the United States. It is argued that the present is important for the development of the country and that it is important to study the present in the past.

7. The seventh part of the paper discusses the role of the past in the history of the United States. It is argued that the past is important for the development of the country and that it is important to study the past in the past.

8. The eighth part of the paper discusses the role of the future in the history of the United States. It is argued that the future is important for the development of the country and that it is important to study the future in the past.

9. The ninth part of the paper discusses the role of the present in the history of the United States. It is argued that the present is important for the development of the country and that it is important to study the present in the past.

10. The tenth part of the paper discusses the role of the past in the history of the United States. It is argued that the past is important for the development of the country and that it is important to study the past in the past.

Panel 7

$$\begin{aligned}5.34 H - 0.63 G &= -.93 \\-0.77 H + 3.77 G &= -.98 \\G &= -.30 \\H &= -.21\end{aligned}$$

$$R_7 = \frac{-2.96 \times .21 - 2.91 \times .3}{3.91} = -.38$$

$$M_{GH} = 2(-.30 - \frac{.21}{2} + .38) = -.06$$

$$M_{HG} = 2(-.21 - \frac{.30}{2} + .38) = .06$$

Panel 8

$$\begin{aligned}5.02 H - 0.52 I &= -.0.93 \\-0.20 H + 6.77 I &= 0 \\H &= -0.19 \\I &= -0.01\end{aligned}$$

$$R_8 = \frac{-2.91 \times .01 - 2.83 \times .19}{3.83} = -0.15$$

$$M_{HI} = 2(-.19 - \frac{.01}{2} + .15) = -.08$$

$$M_{IH} = 2(-.01 - \frac{.19}{2} + .15) = .08$$

SECOND MOMENT CORRECTIONS

Load at B

Panel 1

$$\begin{aligned} 6.77 A - 0.20 B &= 0 \\ -0.52 A + 5.02 B &= -.60 \end{aligned}$$

$$\begin{aligned} A &= 0 \\ B &= -.12 \end{aligned}$$

$$R_1 = \frac{-2.83 \times .12}{3.83} = -.09$$

$$M_{AB} = 2\left(0 - \frac{.12}{2} + .09\right) = .06$$

$$M_{BA} = 2(-.12 + .09) = -.06$$

Panel 2

$$5.34 B - 0.63 C = -.12$$

$$-0.77 B + 3.77 C = .12$$

$$B = .03$$

$$C = .04$$

$$R_2 = \frac{-2.96 \times .03 - 2.91 \times .04}{3.91} = -.05$$

$$M_{BC} = 2(-.03 - \frac{.04}{2} + .05) = 0$$

$$M_{CB} = 2(-.04 - \frac{.03}{2} + .05) = -.01$$

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Load at PP1

| | Panel | 1 | | 2 | | 3 | | 4 | |
|-------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | Joint | A | B | B | C | C | D | D | E |
| Initial
Values | -Q | +5.32 | +6.27 | -1.16 | -1.21 | -1.16 | -1.19 | -0.94 | -0.94 |
| | ∞ | +1.31 | +1.33 | -0.26 | -0.37 | -0.43 | -0.64 | -0.63 | -0.63 |
| | R | +4.76 | | -0.87 | | -1.10 | | -1.18 | |
| | M' | -6.56 | -6.04 | +1.29 | +1.11 | +1.40 | +1.10 | +0.96 | +0.96 |
| First
Incre-
ment | -Q | +0.00 | -1.29 | +6.04 | -1.40 | -1.11 | -0.96 | -1.10 | -0.96 |
| | ∞ | -0.01 | -0.25 | +1.11 | -0.14 | -0.39 | -0.54 | -0.71 | -0.67 |
| | R | -0.19 | | +0.74 | | -0.70 | | -1.03 | |
| | M' | +0.12 | -0.12 | +0.60 | -0.64 | + .12 | - .12 | - .08 | + .04 |
| | -Q | +0.00 | -0.60 | -0.12 | -0.12 | +0.64 | -0.04 | +0.12 | +0.12 |
| | ∞ | +0.00 | -0.12 | -0.03 | -0.04 | | | | |
| | R | -0.09 | | -0.05 | | | | | |
| | M' | +0.06 | -0.06 | +0.00 | -0.01 | - | - | - | - |
| | M | -6.38 | -6.22 | +1.89 | +0.46 | +1.52 | +0.98 | +0.88 | +1.00 |

| | 5 | | 6 | | 7 | | 8 | |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|
| | E | F | F | G | G | H | H | I |
| -Q | -0.94 | -0.94 | -0.82 | -0.80 | -0.87 | -0.83 | -0.90 | -0.73 |
| α | -0.63 | -0.63 | -0.47 | -0.30 | -0.27 | -0.19 | -0.21 | -0.11 |
| R | -1.18 | | -0.78 | | -0.63 | | -0.73 | |
| M | +0.96 | +0.96 | +0.64 | +0.98 | +0.81 | +0.93 | +0.93 | +1.02 |
| -Q | -0.96 | -0.64 | -0.96 | -0.81 | -0.98 | -0.93 | -0.93 | +0.00 |
| α | -0.49 | -0.58 | -0.50 | -0.31 | -0.30 | -0.21 | -0.19 | -0.01 |
| R | -0.80 | | -0.61 | | -0.38 | | -0.15 | |
| M' | +0.08 | -0.12 | -0.15 | +0.15 | -0.06 | +0.06 | -0.08 | +0.08 |
| | +0.08 | +0.15 | +0.12 | +0.06 | -0.15 | +0.08 | -0.06 | |
| | - | - | - | - | - | - | - | - |
| | +1.04 | +0.84 | +0.49 | +1.13 | +0.75 | +0.99 | +0.85 | +1.10 |

1. The first part of the document is a list of names and addresses of the members of the committee. The names are listed in alphabetical order, and the addresses are given below each name. The list includes the names of the members of the committee, the names of the members of the sub-committee, and the names of the members of the advisory committee. The addresses are given in the following order: the address of the member of the committee, the address of the member of the sub-committee, and the address of the member of the advisory committee.

2. The second part of the document is a list of the names and addresses of the members of the committee. The names are listed in alphabetical order, and the addresses are given below each name. The list includes the names of the members of the committee, the names of the members of the sub-committee, and the names of the members of the advisory committee. The addresses are given in the following order: the address of the member of the committee, the address of the member of the sub-committee, and the address of the member of the advisory committee.

3. The third part of the document is a list of the names and addresses of the members of the committee. The names are listed in alphabetical order, and the addresses are given below each name. The list includes the names of the members of the committee, the names of the members of the sub-committee, and the names of the members of the advisory committee. The addresses are given in the following order: the address of the member of the committee, the address of the member of the sub-committee, and the address of the member of the advisory committee.

4. The fourth part of the document is a list of the names and addresses of the members of the committee. The names are listed in alphabetical order, and the addresses are given below each name. The list includes the names of the members of the committee, the names of the members of the sub-committee, and the names of the members of the advisory committee. The addresses are given in the following order: the address of the member of the committee, the address of the member of the sub-committee, and the address of the member of the advisory committee.

5. The fifth part of the document is a list of the names and addresses of the members of the committee. The names are listed in alphabetical order, and the addresses are given below each name. The list includes the names of the members of the committee, the names of the members of the sub-committee, and the names of the members of the advisory committee. The addresses are given in the following order: the address of the member of the committee, the address of the member of the sub-committee, and the address of the member of the advisory committee.

First Moment Corrections

Load at C

Panel 1

$$6.77A - 0.20B = 0$$

$$-0.52A + 5.02B = 5.55$$

$$A = .33$$

$$B = 1.11$$

$$R_1 = \frac{2.91 \times .33 + 2.83 \times 1.11}{3.33} = 1.07$$

$$M_{AB} = 2\left(.33 + \frac{1.11}{2} - 1.07\right) = -.36$$

$$M_{BA} = 2\left(1.11 + \frac{.33}{2} - 1.07\right) = .40$$

Panel 2

$$5.34B - 0.63C = 5.16$$

$$-0.77B + 3.77C = -2.40$$

$$B = .91$$

$$C = -.45$$

$$R_2 = \frac{2.96 \times .91 - 2.91 \times .45}{3.91} = .35$$

$$M_{BC} = 2\left(.91 - \frac{.45}{2} - .35\right) = 1.02$$

$$M_{CB} = 2\left(-.45 + \frac{.91}{2} - .35\right) = -1.05$$

Panel 3

$$4.06C - 0.89D = 4.83$$

$$-1.02C + 2.53D = -1.88$$

$$C = 1.13$$

$$D = -0.29$$

$$R_3 = \frac{2.95 \times 1.13 - 2.90 \times .29}{3.90} = .64$$

$$M_{CD} = 3\left(1.13 - \frac{.29}{2} - .64\right) = 1.08$$

$$M_{DC} = 3\left(-.29 + \frac{1.13}{2} - .64\right) = -1.08$$

Panel 4

$$\begin{aligned} 2.5D - E &= -2.32 \\ -D + 2.5E &= -1.88 \\ D &= -1.34 \\ E &= -1.46 \end{aligned}$$

$$R_4 = \frac{3}{4}(-1.34 - 1.46) = -2.10$$

$$M_{DE} = 4(-1.34 - \frac{1.46}{2} + 2.10) = .12$$

$$M_{ED} = 4(-1.46 - \frac{1.34}{2} + 2.10) = -.12$$

Panel 5

$$\begin{aligned} 2.5E - F &= -1.88 \\ -E + 2.5F &= -1.29 \\ E &= -1.14 \\ F &= -.97 \end{aligned}$$

$$R_5 = \frac{3}{4}(-1.14 - .97) = -1.58$$

$$M_{EF} = 4(-1.14 - \frac{.97}{2} + 1.58) = -.16$$

$$M_{FE} = 4(-.97 - \frac{1.14}{2} + 1.58) = .16$$

Panel 6

$$\begin{aligned} 2.53F - 1.02G &= -1.88 \\ -0.89F + 4.06G &= -1.62 \\ F &= -.99 \\ G &= -.62 \end{aligned}$$

$$R_6 = \frac{-2.95 \times .62 - 2.90 \times .60}{3.91} = -.77$$

$$M_{FG} = 3(-.99 - \frac{.62}{2} + .77) = -.40$$

$$M_{GF} = 3(-.62 - \frac{.99}{2} + .77) = .32$$

Panel 7

$$3.77G - 0.77H = -1.96$$

$$-0.63G + 5.34H = -1.85$$

$$G = -.60$$

$$H = -.42$$

$$R_7 = \frac{-2.91 \times .60 - 2.96 \times .42}{3.91} = -.77$$

$$M_{GH} = 2(-.60 - \frac{.42}{2} + .77) = -.12$$

$$M_{HG} = 2(-.42 - \frac{.60}{2} + .77) = .15$$

Panel 8

$$5.02H - 0.52I = -1.87$$

$$-0.20H + 6.72I = 0$$

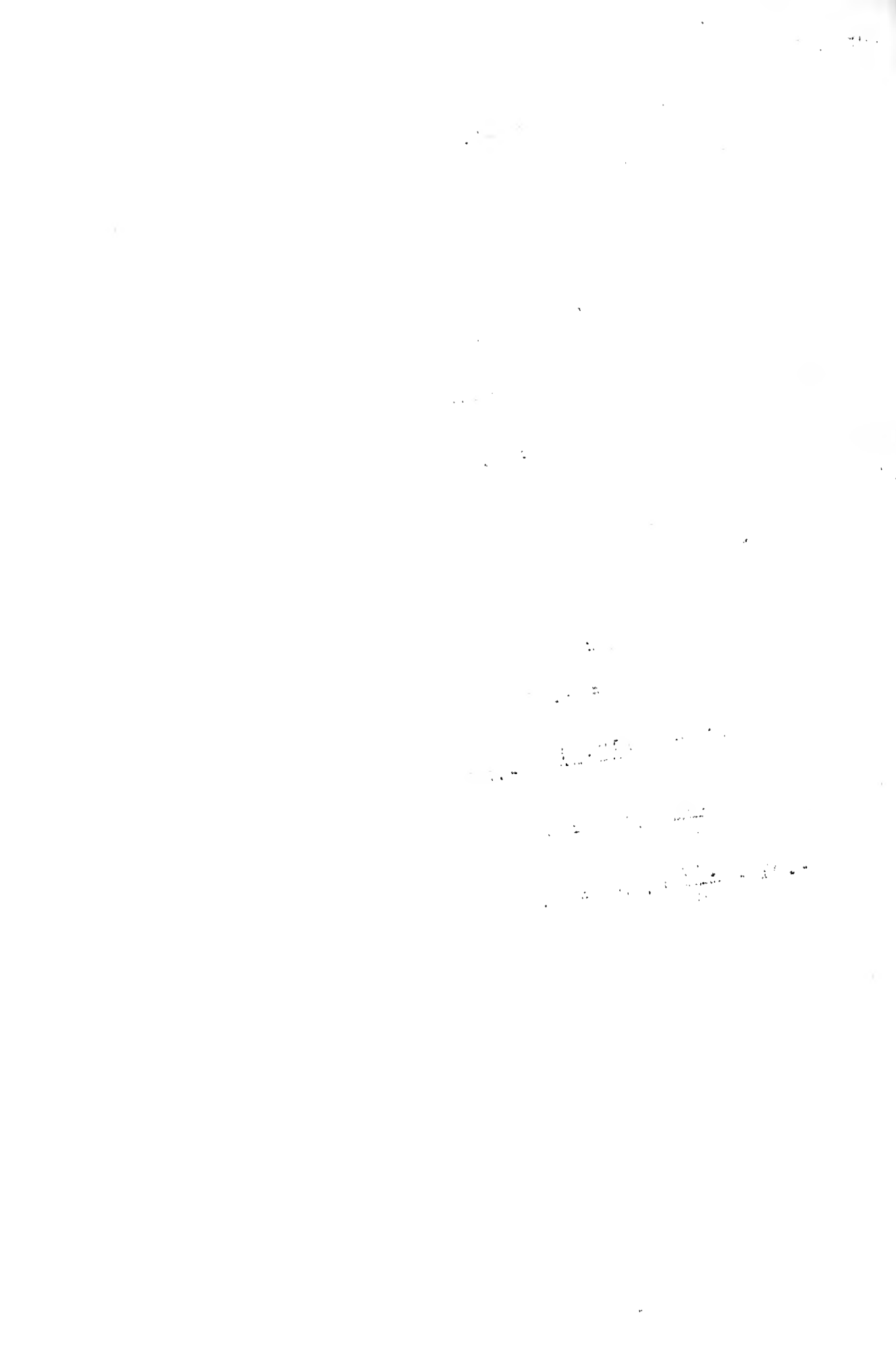
$$H = -.37$$

$$I = -.01$$

$$R_8 = \frac{-2.83 \times .37 - 2.91 \times .01}{3.83} = -.28$$

$$M_{HI} = 2(-.37 - \frac{.01}{2} + .28) = -.18$$

$$M_{IH} = 2(-.01 - \frac{.37}{2} + .28) = .18$$



Second Moment Corrections - Load at C

Panel 1

$$\begin{aligned} 6.77A - 0.20B &= 0 \\ -0.52A + 5.02B &= -1.02 \\ A &= -.01 \\ B &= -.20 \end{aligned}$$

$$R_1 = \frac{-2.91 \times .01 - 2.83 \times .20}{3.83} = -.16$$

$$M_{AB} = 2(-.01 - \frac{.20}{2} + .16) = .10$$

$$M_{BA} = 2(-.20 - \frac{.01}{2} + .16) = -.10$$

Panel 2

$$\begin{aligned} 5.34B - 0.63C &= -.40 \\ -0.77B + 3.77C &= -1.08 \\ B &= -.11 \\ C &= -.28 \end{aligned}$$

$$R_2 = \frac{-2.96 \times .11 - 2.91 \times .28}{3.91} = -.30$$

$$M_{BC} = 2(-.11 - \frac{.28}{2} + .30) = .15$$

$$M_{CB} = 2(-.28 - \frac{.11}{2} + .30) = -.09$$

Panel 3

$$\begin{aligned} 4.06C - 0.89D &= 1.05 \\ -1.02C + 2.53D &= -.12 \\ C &= .27 \\ D &= .06 \end{aligned}$$

$$R_3 = \frac{2.95 \times .27 + 2.90 \times .06}{3.90} = .24$$

$$M_{CD} = 3(.27 + \frac{.06}{2} - .24) = .24$$

$$M_{DC} = 3(.06 + \frac{.27}{2} - .24) = -.16$$

Panel 4

$$2.5D - E = 1.08$$

$$- D + 2.5E = .16$$

$$D = .74$$

$$E = .36$$

$$R_5 = \frac{3}{4}(.74 + .36) = .82$$

$$M_{DE} = 4(.74 + \frac{.36}{2} - .82) = .40$$

$$M_{ED} = 4(.36 + \frac{.74}{2} - .82) = -.36$$

Panel 5

$$2.5E - F = .12$$

$$- E + 2.5F = .40$$

$$E = .13$$

$$F = .21$$

$$R_5 = \frac{3}{4}(.13 + .21) = .25$$

$$M_{EF} = 4(.13 + \frac{.21}{2} - .25) = -.08$$

$$M_{FE} = 4(.21 + \frac{.13}{2} - .25) = .08$$

Panel 6

$$2.53F - 1.02G = -.16$$

$$-0.89F + 4.06G = .12$$

$$F = -.06$$

$$G = .02$$

$$R_6 = \frac{-2.90 \times .06 + 2.95 \times .02}{3.90} = -.03$$

$$M_{FG} = 3(-.06 + \frac{.02}{2} + .03) = -.06$$

$$M_{GF} = 3(.02 - \frac{.06}{2} + .03) = .06$$

Panel 7

$$3.77G - 0.77H = -.32$$

$$-0.63G + 5.34H = .18$$

$$G = -.08$$

$$H = .02$$

$$R_7 = \frac{2.96 \times .02 - 2.91 \times .08}{3.91} = -.04$$

$$M_{GH} = 2(-.08 + \frac{.02}{2} + .04) = -.06$$

$$M_{HG} = 2(.02 - \frac{.08}{2} + .04) = .04$$

Panel 8

$$5.02H - 0.52I = -.15$$

$$-0.20H + 6.77I = 0$$

$$H = -.03$$

$$I = 0$$

$$R_8 = \frac{-2.83 \times .03}{3.83} = -.02$$

$$M_{HI} = 2(-.03 + .02) = -.02$$

$$M_{IH} = 2(\frac{-.03}{2} + .02) = .02$$

1. The first part of the document discusses the importance of maintaining accurate records of all transactions.

2. The second part of the document discusses the importance of maintaining accurate records of all transactions.

3. The third part of the document discusses the importance of maintaining accurate records of all transactions.

4. The fourth part of the document discusses the importance of maintaining accurate records of all transactions.

5. The fifth part of the document discusses the importance of maintaining accurate records of all transactions.

6. The sixth part of the document discusses the importance of maintaining accurate records of all transactions.

7. The seventh part of the document discusses the importance of maintaining accurate records of all transactions.

Load at PP2

| Panel | 1 | | 2 | | 3 | | 4 | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Joint | A | B | B | C | C | D | D | E |
| -Q | 4.56 | 5.38 | 4.98 | 5.23 | -2.33 | -2.38 | -1.87 | -1.87 |
| × | 0.71 | 1.14 | 1.14 | 1.62 | -0.72 | -0.76 | -1.25 | -1.25 |
| R | 4.07 | | 3.80 | | -1.70 | | -2.34 | |
| M' | -5.58 | -5.16 | -5.55 | -4.83 | 2.40 | 2.32 | 1.88 | 1.88 |
| -Q | 0.00 | 5.55 | 5.16 | -2.40 | 4.83 | -1.88 | -2.32 | -1.88 |
| × | 0.33 | 1.11 | 0.91 | -0.45 | 1.13 | -0.29 | -1.34 | -1.46 |
| R | 1.07 | | 0.35 | | 0.64 | | -2.10 | |
| M'' | -0.36 | 0.40 | 1.02 | -1.05 | 1.08 | -1.08 | 0.12 | -0.12 |
| -Q | 0.00 | -1.02 | -0.40 | -1.08 | 1.05 | -0.12 | 1.08 | 0.16 |
| × | -0.01 | -0.20 | -0.11 | -0.28 | 0.27 | 0.06 | 0.74 | 0.36 |
| R | -0.16 | | -0.30 | | 0.24 | | 0.82 | |
| M''' | 0.10 | -0.10 | 0.15 | -0.09 | 0.24 | -0.16 | 0.40 | -0.36 |
| M | -5.84 | -4.81 | -4.38 | -5.97 | 3.72 | 1.08 | 2.40 | 1.40 |

1. The first part of the paper discusses the importance of the study of the history of the English language. It is noted that the English language has a long and rich history, and that the study of its history is essential for a full understanding of the language. The paper then discusses the various factors that have influenced the development of the English language, including the influence of other languages, the influence of social and cultural changes, and the influence of technological advances.

2. The second part of the paper discusses the importance of the study of the history of the English language. It is noted that the English language has a long and rich history, and that the study of its history is essential for a full understanding of the language. The paper then discusses the various factors that have influenced the development of the English language, including the influence of other languages, the influence of social and cultural changes, and the influence of technological advances.

3. The third part of the paper discusses the importance of the study of the history of the English language. It is noted that the English language has a long and rich history, and that the study of its history is essential for a full understanding of the language. The paper then discusses the various factors that have influenced the development of the English language, including the influence of other languages, the influence of social and cultural changes, and the influence of technological advances.

4. The fourth part of the paper discusses the importance of the study of the history of the English language. It is noted that the English language has a long and rich history, and that the study of its history is essential for a full understanding of the language. The paper then discusses the various factors that have influenced the development of the English language, including the influence of other languages, the influence of social and cultural changes, and the influence of technological advances.

5. The fifth part of the paper discusses the importance of the study of the history of the English language. It is noted that the English language has a long and rich history, and that the study of its history is essential for a full understanding of the language. The paper then discusses the various factors that have influenced the development of the English language, including the influence of other languages, the influence of social and cultural changes, and the influence of technological advances.

| 5 | | 6 | | 7 | | 8 | |
|-------|-------|-------|-------|-------|-------|-------|-------|
| E | F | F | G | G | H | H | I |
| -1.87 | -1.87 | -1.64 | -1.60 | -1.75 | -1.67 | -1.79 | -1.45 |
| -1.25 | -1.25 | -0.94 | -0.60 | -0.54 | -0.37 | -0.41 | -0.23 |
| -2.34 | | -1.56 | | -1.27 | | -1.45 | |
| 1.88 | 1.88 | 1.29 | 1.96 | 1.62 | 1.87 | 1.85 | 2.04 |
| -1.88 | -1.29 | -1.88 | -1.62 | -1.96 | -1.85 | -1.87 | 0.00 |
| -1.14 | -0.97 | -0.99 | -0.62 | -0.60 | -0.42 | -0.37 | -0.01 |
| -1.58 | | -1.20 | | -0.77 | | -0.28 | |
| -0.16 | 0.16 | -0.40 | 0.32 | -0.12 | 0.15 | -0.18 | 0.18 |
| 0.12 | 0.40 | -0.16 | 0.12 | -0.32 | 0.18 | -0.15 | 0.00 |
| 0.13 | 0.21 | -0.06 | 0.02 | -0.08 | 0.02 | -0.03 | 0.00 |
| 0.25 | | -0.03 | | -0.04 | | -0.02 | |
| -0.08 | 0.08 | -0.06 | 0.06 | -0.06 | 0.04 | -0.02 | 0.02 |
| 1.64 | 2.12 | 0.83 | 2.34 | 1.38 | 2.06 | 1.65 | 2.24 |

Influence Lines - First Correction

Load at Panel Pt 3 (= D)

Panel 1

$$6.77A - .2B = 0$$

$$A = .03$$

$$-.52A + 5.02B = 4.71$$

$$R_1 = \frac{(3 - .0866).03 + (3 - .1732).94}{2(2 - .0866)} = .72$$

$$M_{AB} = 2(.03 + \frac{.94}{2} - .72) = -.44$$

$$M_{BA} = 2(.94 + \frac{.03}{2} - .72) = .46$$

Panel 2

$$5.34B - .62C = 4.30$$

$$B = .98$$

$$-.76B + 3.77C = 4.84$$

$$C = 1.48$$

$$R_2 = \frac{(3 - .0443).98 + (3 - .0886)1.48}{2(2 - .0443)} = 1.84$$

$$M_{BC} = 3(.98 + \frac{1.48}{2} - 1.84) = -.36$$

$$M_{CB} = 3(1.48 + \frac{.98}{2} - 1.84) = .39$$

Panel 3

$$4.05C - .9D = 4.11$$

$$C = .84$$

$$-1.02C + 2.53D = -2.84$$

$$D = -.78$$

$$R_3 = \frac{(3 - .0482).84 + (3 - .0964)(-.78)}{2(2 - .0482)} = .06$$

$$M_{CD} = 4(.84 - \frac{.78}{2} - .06) = 1.56$$

$$M_{DC} = 4(-.78 + \frac{.84}{2} - .06) = -1.68$$

Panel 4

$$2.5D - 1E = 3.36$$

$$-1D + 2.5E = -2.81$$

$$D = 1.07$$

$$E = -.70$$

$$R = \frac{3}{4}(1.07 - .70) = .28$$

$$M_{DE} = 4(1.07 - \frac{.70}{2} - .28) = 1.76$$

$$M_{ED} = 4(-.70 + \frac{1.07}{2} - .28) = -1.80$$

Panel 5

$$2.5F - 1E = -2.84$$

$$-1F + 2.5E = -1.93$$

$$E = -1.46$$

$$F = -1.72$$

$$R = \frac{3}{4}(-1.46 - 1.72) = -2.38$$

$$M_{FE} = 4(-1.72 - \frac{1.46}{2} + 2.38) = -.28$$

$$M_{EF} = 4(-1.46 - \frac{1.72}{2} + 2.38) = .24$$

Panel 6

$$4.05G - 0.9F = -2.43$$

$$-1.02G + 2.53F = -2.81$$

$$G = -.93$$

$$F = -1.48$$

$$R = \frac{-(3 - .0482) \cdot .93 - (3 - .0964)1.48}{2(2 - .0482)} = -1.80$$

$$M_{FG} = 4(-1.48 - \frac{.93}{2} + 1.80) = -.56$$

$$M_{GF} = 4(-.93 - \frac{1.48}{2} + 1.80) = .52$$

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11.11.11

Panel 7

$$5.34 \text{ H} - .62 \text{ G} = -2.78$$

$$-.76 \text{ H} + 3.77 \text{ G} = -2.94$$

$$\text{G} = -.91$$

$$\text{H} = -.63$$

$$\text{R} = - \frac{(3-.0443) \cdot .63 - (3-.0886) \cdot .91}{2(2-.0443)} = -1.15$$

$$\text{M}_{\text{GH}} = 3 \left(-.91 - \frac{.63}{2} + 1.15 \right) = -.21$$

$$\text{M}_{\text{HG}} = 3 \left(-.63 - \frac{.91}{2} + 1.15 \right) = .21$$

Panel 8

$$6.77 \text{ I} - .2 \text{ H} = 0$$

$$-.52 \text{ I} + 5.02 \text{ H} = -2.80$$

$$\text{H} = -.56$$

$$\text{I} = -.02$$

$$\text{R} = - \frac{(3-.0866) \cdot .02 - (3-.1732) \cdot .56}{2(2-.0866)} = -.43$$

$$\text{M}_{\text{HI}} = 2 \left(-.56 - \frac{.02}{2} + .43 \right) = -.28$$

$$\text{M}_{\text{IH}} = 2 \left(-.02 - \frac{.56}{2} + .43 \right) = .26$$

1. The first part of the paper is devoted to the study of the properties of the function $f(x)$ defined by the equation

$$f(x) = \frac{1}{x} \int_0^x f(t) dt$$

$$f(0) = 1$$

It is shown that the function $f(x)$ is continuous and differentiable at the origin.

$$f'(0) = \lim_{x \rightarrow 0} \frac{f(x) - f(0)}{x} = \lim_{x \rightarrow 0} \frac{f(x) - 1}{x}$$

$$= \lim_{x \rightarrow 0} \frac{f(x) - 1}{x} = \lim_{x \rightarrow 0} \frac{f(x) - 1}{x}$$

$$f(x) = \frac{1}{x} \int_0^x f(t) dt$$

$$f(0) = 1$$

$$f'(0) = \lim_{x \rightarrow 0} \frac{f(x) - f(0)}{x}$$

$$= \lim_{x \rightarrow 0} \frac{f(x) - 1}{x} = \lim_{x \rightarrow 0} \frac{f(x) - 1}{x}$$

$$= \lim_{x \rightarrow 0} \frac{f(x) - 1}{x} = \lim_{x \rightarrow 0} \frac{f(x) - 1}{x}$$

$$= \lim_{x \rightarrow 0} \frac{f(x) - 1}{x} = \lim_{x \rightarrow 0} \frac{f(x) - 1}{x}$$

Influence Lines - Second Correction

Load @ PP3 = D

Panel 1

$$6.77 A - .2 B = 0$$

$$-.52 A + 5.02 B = +.44$$

$$A = .003$$

$$B = .090$$

$$R_1 = \frac{(3 - .0866) \cdot 0.003 + (3 - 1.732) \cdot 0.09}{2(2 - .0866)} = .094$$

$$M_{AB} = 2\left(.003 + \frac{.090}{2} - .094\right) = -.09$$

$$M_{BA} = 2\left(.090 + .003 - .094\right) = -.01$$

Panel 2

$$5.34 B - .62 C = -.46$$

$$-.76 B + 3.77 C = 1.56$$

$$B = -.04$$

$$C = .41$$

$$R_2 = \frac{(3 - .0443) \cdot -.04 + (3 - .0886) \cdot (.41)}{2(2 - .0443)} = .28$$

$$M_{BC} = 3\left(-.04 + \frac{.41}{2} - .28\right) = -.36$$

$$M_{CB} = 3\left(+.41 - \frac{.04}{2} - .28\right) = .33$$

Panel 3

$$4.05 C - 0.9 D = -.39$$

$$-1.02 C + 2.53 D = -1.76$$

$$C = -.27$$

$$D = -.81$$

$$R_3 = \frac{(3 - .0482) \cdot (-.27) + (3 - .0964) \cdot (-.81)}{2(2 - .0482)} = -.80$$

$$M_{CD} = 4\left(-.27 - \frac{.81}{2} + .80\right) = .52$$

$$M_{DC} = 4\left(-.81 - \frac{.27}{2} + .80\right) = -.44$$

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Panel 4

$$2.5 D - 1E = 1.68$$

$$-1.0 D + 2.5 E = -.24$$

$$D = .75$$

$$E = .21$$

$$R_4 = \frac{3}{4} (.75 + .21) = .72$$

$$M_{DE} = 4(.75 + \frac{.21}{2} - .72) = .52$$

$$M_{ED} = 4(.21 + \frac{.75}{2} - .72) = -.56$$

Panel 5

$$-1 F + 2.5 E = 1.80$$

$$2.5 F + 1.0 E = 1.56$$

$$E = .96$$

$$F = .61$$

$$R_5 = \frac{3}{4} (.96 + .61) = 1.18$$

$$M_{EF} = 4(.96 + \frac{.61}{2} - 1.18) = .32$$

$$M_{FE} = 4(.61 + \frac{.96}{2} - 1.18) = -.40$$

Panel 6

$$-1.02 G + 2.53 F = .28$$

$$4.05 G - 0.9 F = .21$$

$$G = .08$$

$$F = .14$$

$$R_6 = \frac{(3-.0482).08 + (3-.0964).14}{2(2-.0482)} = .16$$

$$M_{FG} = 4(.14 + \frac{.08}{2} - .16) = .08$$

$$M_{GF} = 4(.08 + \frac{.14}{2} - .16) = -.04$$

Panel 7

$$-.76 H + 3.77 G = -.52$$

$$5.34 H - .62 G = .28$$

$$H = .04$$

$$G = -.13$$

$$R_7 = \frac{(3-.0443).04 - (3-.0886).13}{2(2-.0443)} = -.07$$

$$M_{GH} = 3(-.13 + \frac{.04}{2} + .07) = -.12$$

$$M_{HG} = 3(.04 - \frac{.13}{2} + .07) = .15$$

Panel 8

$$-.52 I + 5.02 H = -.21$$

$$6.77 I - 0.20 H = 0$$

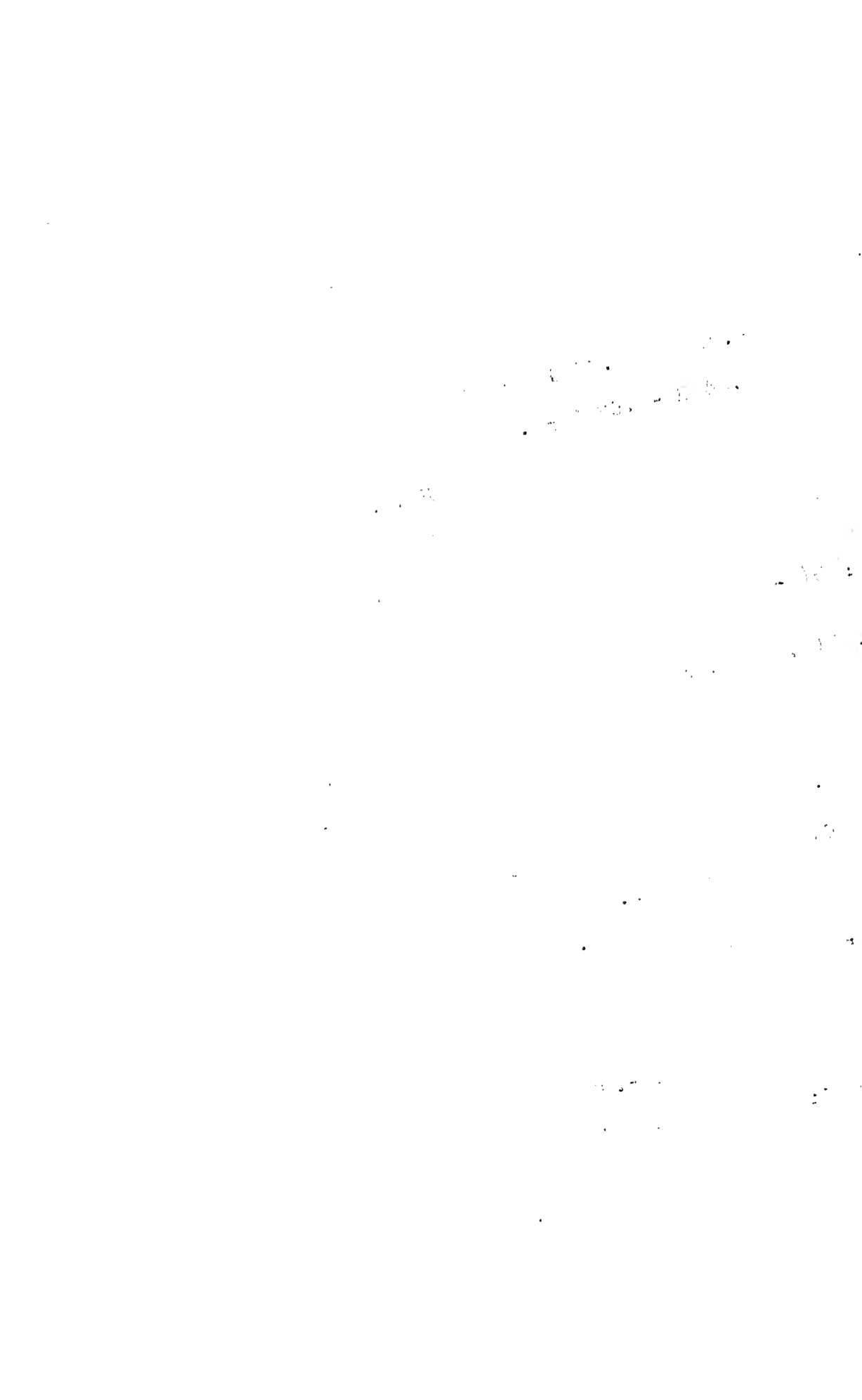
$$I = 0$$

$$H = -.04$$

$$R_8 = -\frac{(3-.1732).04}{2(2-.0866)} = -.03$$

$$M_{HI} = 2(-.04 + .03) = -.02$$

$$M_{IH} = 2(-\frac{.04}{2} + .03) = .02$$



Load At PP3 = D

| Panel
Point | 1 | | 2 | | 3 | | 4 | |
|----------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | A | B | B | C | C | D | D | E |
| Q | 3.81 | 4.49 | 4.16 | 4.36 | 4.02 | 4.12 | -2.81 | -2.81 |
| Q | .59 | .96 | .94 | 1.34 | 1.49 | 2.23 | -1.87 | -1.87 |
| R | 3.40 | | 3.18 | | 3.81 | | -3.51 | |
| M' | -4.66 | -4.30 | -4.71 | -4.11 | -4.84 | -3.36 | 2.84 | 2.84 |
| -Q | 0 | 4.71 | 4.30 | 4.84 | 4.11 | -2.82 | 3.36 | -2.81 |
| Q | .03 | .94 | .98 | 1.48 | .84 | -.78 | 1.07 | -.70 |
| R | .72 | | 1.84 | | .06 | | .28 | |
| M'' | -.44 | .46 | -.36 | .39 | 1.56 | -1.68 | 1.76 | -1.80 |
| -Q | 0 | .44 | -.46 | 1.56 | -.39 | -1.76 | 1.68 | -.24 |
| Q | .003 | .090 | -.04 | .41 | -.27 | -.81 | .75 | .21 |
| R | .094 | | .28 | | -.80 | | .72 | |
| M''' | -.09 | -.01 | -.36 | .33 | .52 | -.44 | .52 | -.56 |
| Σ M | -5.19 | -3.85 | -5.43 | -3.39 | -2.76 | -5.48 | 5.12 | .48 |

[illegible]

Influence Lines - First Corrections
Load at E

Panels 1 & 8

$$6.77A - 0.20B = 0 \quad A = .02$$

$$-0.52A + 5.02B = 3.72 \quad B = .72$$

$$R_1 = \frac{2.914 \times .02 + 2.828 \times .72}{3.828} = .55$$

$$M_{AB} = 2\left(.02 + \frac{.72}{2} - .55\right) = -.34$$

$$M_{BA} = 2\left(.72 + \frac{.02}{2} - .55\right) = .36$$

Panels 2 & 7

$$5.34B - 0.63C = 3.60 \quad B = .81$$

$$-0.77B + 3.77C = 3.84 \quad C = 1.18$$

$$R_2 = \frac{2.96 \times .81 + 2.91 \times 1.18}{3.912} = 1.49$$

$$M_{BC} = 3\left(.81 + \frac{1.18}{2} - 1.49\right) = -.27$$

$$M_{CB} = 3\left(1.18 + \frac{.81}{2} - 1.49\right) = .27$$

Panels 3 & 6

$$4.06C - 0.89D = 3.24 \quad C = 1.23$$

$$-1.02C + 2.53D = 3.76 \quad D = 1.99$$

$$R_3 = \frac{2.95 \times 1.23 + 2.90 \times 1.99}{3.904} = 2.40$$

$$M_{CD} = 4\left(1.23 + \frac{1.99}{2} - 2.40\right) = -.72$$

$$M_{DC} = 4\left(1.99 + \frac{1.23}{2} - 2.40\right) = .80$$

Panels 4 & 5

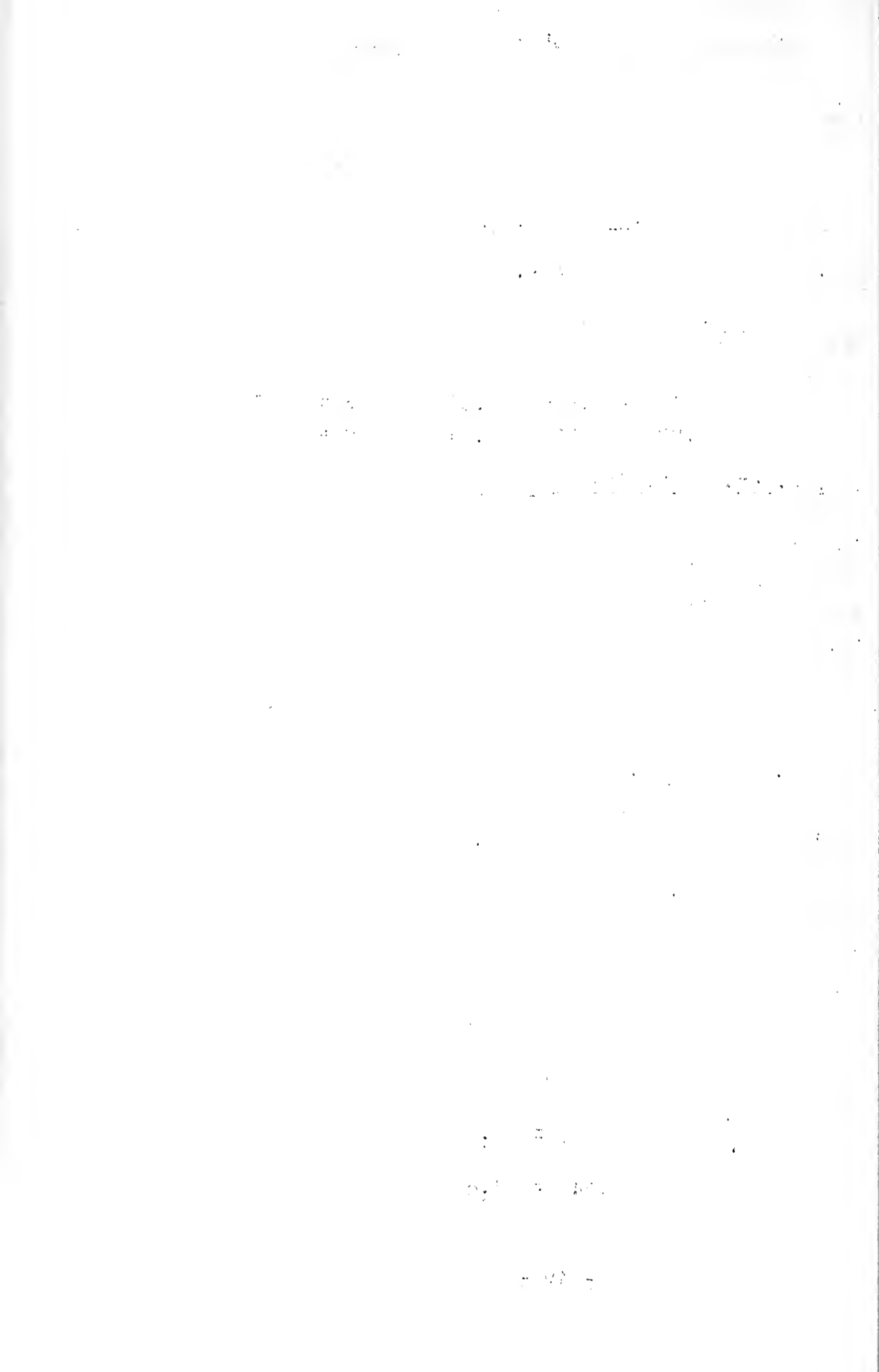
$$2.5E - 1.0D = 2.68$$

$$-1.0E + 2.5D = -3.75$$

$$R_4 = \frac{3}{4}(-1.28 + .56) = -.54$$

$$M_{DE} = 4\left(-1.28 + \frac{.56}{2} + .54\right) = -1.84$$

$$M_{ED} = 4\left(.56 - \frac{1.28}{2} + .54\right) = 1.84$$



Influence Lines - Second Correction

Load at E

Panels 1 & 8

$$6.77A - 0.20B = 0$$

$$A = 0$$

$$-0.52A + 5.02B = .27$$

$$B = .05$$

$$R_4 = .04$$

$$R_1 = \frac{2.914 \times 0 + 2.828 \times .05}{3.828}$$

$$M_{AB} = 2 \left(0 + \frac{.05}{2} - .04 \right) = -.04$$

$$M_{BA} = 2 \left(.05 + \frac{0}{2} - .04 \right) = .02$$

Panels 2 & 7

$$5.34B - 0.63C = -.36$$

$$B = -.05$$

$$-0.77B + 3.77C = .72$$

$$C = .18$$

$$R_2 = \frac{-2.96 \times .05 + 2.91 \times .18}{3.912}$$

$$R_4 = .10$$

$$M_{BC} = 3 \left(-.05 + \frac{.18}{2} - .10 \right) = -.18$$

$$M_{CB} = 3 \left(.18 - \frac{.05}{2} - .10 \right) = .18$$

Panels 3 & 6

$$4.06C - 0.89D = -.27$$

$$C = -.24$$

$$-1.02C + 2.53D = 1.84$$

$$D = -.86$$

$$R_3 = \frac{2.95(-.25) + 2.90(-.82)}{3.904}$$

$$R_3 = -.80$$

$$M_{CD} = 4 \left(-.25 - \frac{.82}{2} + .80 \right) = .56$$

$$M_{DC} = 4 \left(-.82 - \frac{.25}{2} + .80 \right) = -.56$$

Panels 4 & 5

$$2.5E - 1.0D = -.80$$

$$D = -.02$$

$$-1.0E + 2.5D = 1.84$$

$$E = .73$$

$$R_4 = \frac{3}{4}(-.02 + .73)$$

$$R_4 = .53$$

$$M_{DE} = 4 \left(-.02 + \frac{.73}{2} + .53 \right) = -.76$$

$$M_{ED} = 4 \left(.73 - \frac{.02}{2} - .53 \right) = .76$$

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1. 5. 1. 5. 1. 5.
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1. 5. 1. 5. 1. 5. 1. 5.
1. 5. 1. 5. 1. 5. 1. 5.

Load at Panel Pt 4 = E

| Panel | 1 | | 2 | | 3 | | 4 | |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|
| Joint | A | B | B | C | C | D | D | E |
| -Q | 3.04 | 3.59 | 3.32 | 3.49 | 3.21 | 3.30 | 3.75 | 3.75 |
| α | .47 | .76 | .75 | 1.08 | 1.19 | 1.78 | 2.50 | 2.50 |
| R | 2.79 | | 2.53 | | 3.04 | | 4.69 | |
| M' | -3.88 | -3.60 | -3.72 | -3.24 | -3.84 | -2.68 | -3.76 | -3.76 |
| -Q | 0 | 3.72 | 3.60 | 3.84 | 3.24 | 3.76 | 2.68 | -3.75 |
| α | .02 | .72 | .81 | 1.18 | 1.23 | 1.99 | -1.28 | .56 |
| R | .55 | | 1.49 | | 2.40 | | - .54 | |
| M'' | - .34 | .36 | - .27 | .27 | - .72 | .80 | 1.84 | -1.84 |
| -Q | 0 | .27 | - .36 | .72 | - .27 | -1.84 | - .80 | 1.84 |
| α | 0 | .05 | - .05 | .18 | - .25 | - .82 | - .02 | .73 |
| R | .04 | | .10 | | - .80 | | .53 | |
| M'' | - .04 | .02 | - .18 | .18 | .56 | - .56 | - .76 | .76 |
| M''' | -4.26 | -3.32 | -4.17 | -2.79 | -4.00 | -2.44 | -2.68 | -4.84 |

| Panel | 5 | | 6 | | 7 | | 8 | |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|
| Joint | E | F | F | G | G | H | H | I |
| -Q | -3.75 | -3.75 | -3.29 | -3.20 | -3.50 | -3.33 | -3.58 | -2.91 |
| α | -2.50 | -2.50 | -1.87 | -1.20 | -1.08 | -0.75 | -0.83 | -0.45 |
| R | -4.69 | | -3.12 | | -2.53 | | -2.91 | |
| M | 3.75 | 3.75 | 2.58 | 3.92 | 3.24 | 3.73 | 3.60 | 4.08 |
| -Q | 3.76 | -2.58 | -3.75 | -3.24 | -3.92 | -3.60 | -3.72 | 0 |
| α | 1.30 | - .51 | -1.98 | -1.23 | -1.20 | - .81 | - .72 | - .02 |
| R | .59 | | -2.40 | | -1.51 | | - .55 | |
| M' | 1.84 | 1.80 | - .76 | .72 | - .27 | .30 | - .36 | .34 |
| -Q | -1.84 | .76 | 1.80 | .27 | - .72 | .36 | - .30 | 0 |
| α | - .73 | .02 | .82 | .25 | - .18 | .05 | - .05 | 0 |
| R | - .53 | | .80 | | - .10 | | - .04 | |
| M'' | - .76 | .76 | .56 | - .56 | - .18 | .18 | - .02 | .04 |
| M''' | 4.83 | 2.71 | 2.38 | 4.08 | 2.79 | 4.18 | 3.22 | 4.26 |

Preliminary Moment Computations - Web Members

Member AA'

| | | | |
|-----------------|---|------------|----|
| Moment Dh | = | 3144 | fk |
| hh E-60 | = | 2865 | |
| Impact | = | <u>615</u> | |
| Total | | 3480 | |
| hh H-15-S-12 44 | = | 368 | |
| Conc | = | 86 | |
| Impact | = | <u>50</u> | |
| Total | | 504 | |
| Sidewalk hh | = | 220 | |
| Design Moment | = | 7362 | fk |

Member BB'

| | | | |
|----------------|---|------------|----|
| Dh | = | 5170 | |
| hh E-60 | = | 4410 | |
| Impact | = | <u>950</u> | |
| Total | | 5360 | |
| hh H15-S-12 44 | = | 605 | |
| Conc. | = | 125 | |
| Impact | = | <u>83</u> | |
| Total | | 813 | |
| Sidewalk hh | = | 362 | |
| Design Moment | = | 11,745 | fk |

Member CC'

| | | | |
|----------------|---|------------|----|
| Dh | = | 3000 | |
| hh E-60 | = | 2630 | |
| Impact | = | <u>830</u> | |
| Total | | 3460 | |
| hh H15-S-12-44 | = | 350 | |
| Conc. | = | 92 | |
| Impact | = | <u>67</u> | |
| Total | | 509 | |
| Sidewalk hh | = | 256 | |
| Design Moment | = | 7243 | fk |



Member DD'

DL = 1600

LL E-60 = 1480

Impact = 520

Total 2000

LL H15-S12-44 = 182

Conc. = 69

Impact = 37

Total 288

Sidewalk = 144

Design Moment = 4046 fk

Member EE'

DL = 945

LL E-60 = 910

Impact = 441

Total 1351

LL H15-S12-44 = 110

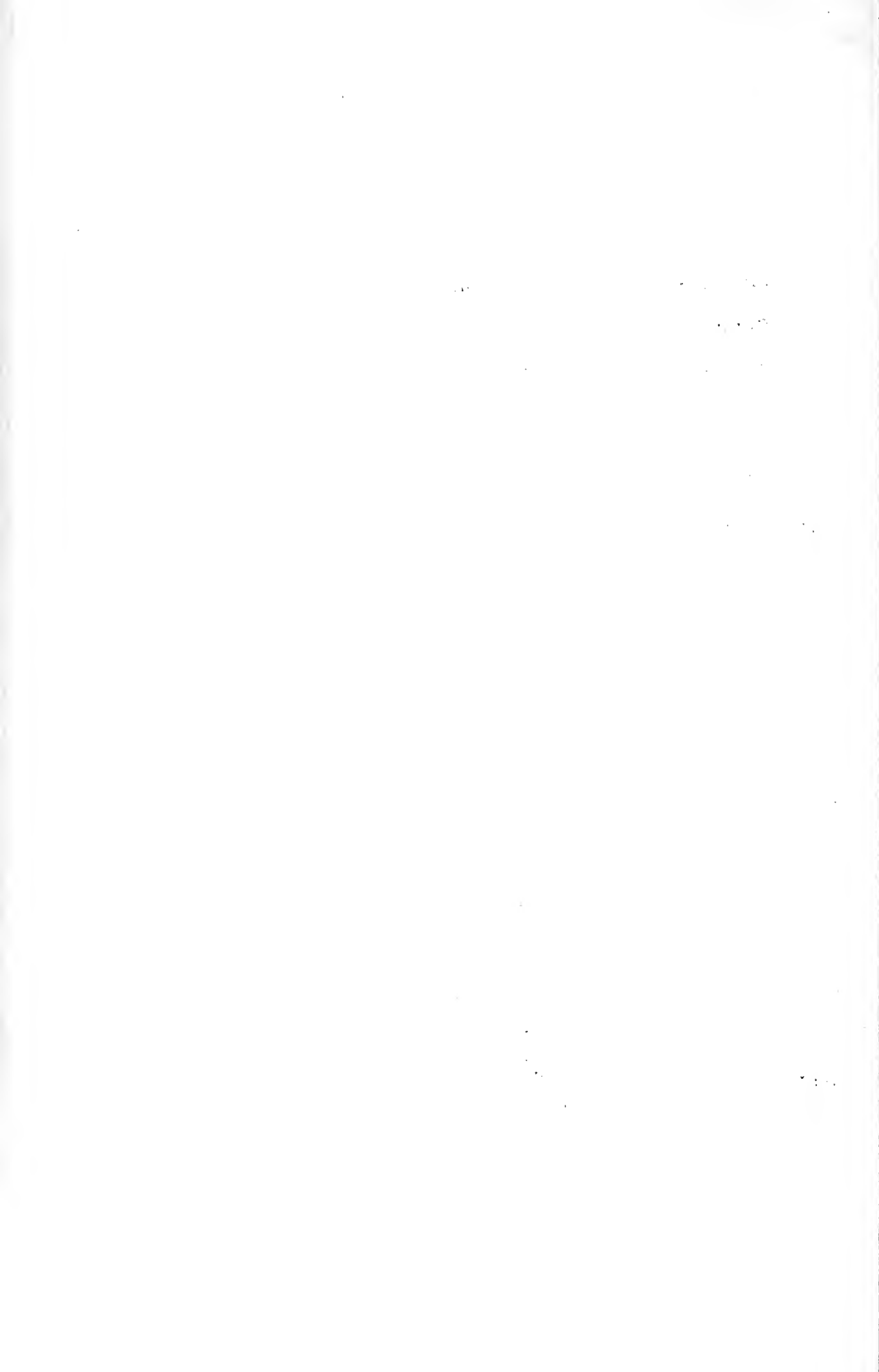
Conc. = 52

Impact = 26

Total 188

Sidewalk = 97

Design Moment = 2593 fk



Preliminary Moment Computations - Chord Members

Member AB

DL = 3440

LL E-60 = 3020

Impact = 695

Total 3715

LL H15-S12-44 = 403

Conc. = 87

Impact = 73

Total 563

Sidewalk hh = 240

Design Moment = 7958 fk

Member BC

DL = 2260

LL E-60 = 2040

Impact = 520

Total 2560

LL H15-S12-44 = 264

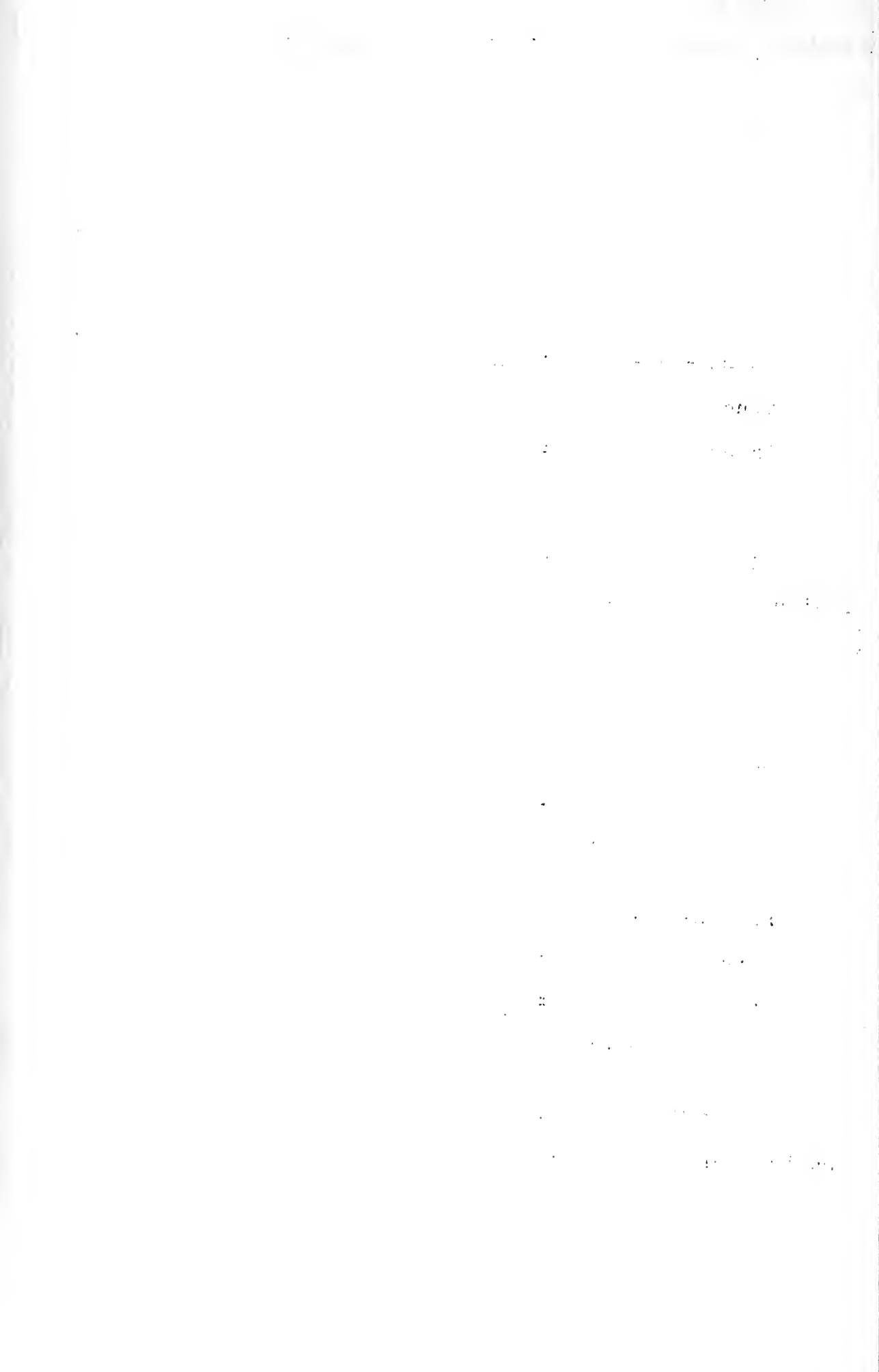
Conc. = 50

Impact = 52

Total 366

Sidewalk hh = 173

Design Moment = 5360 fk



Member CD

DL = 1432

LL E-60 = 1330

Impact = 383

Total 1713

LL H15-S12-44 = 168

Conc. = 73

Impact = 44

Total 285

Sidewalk = 118

Design Moment = 3548 fk

Member DE

DL = 1480

LL E-60 = 1400

Impact = 490

Total 1890

LL H15-S12-44 = 173

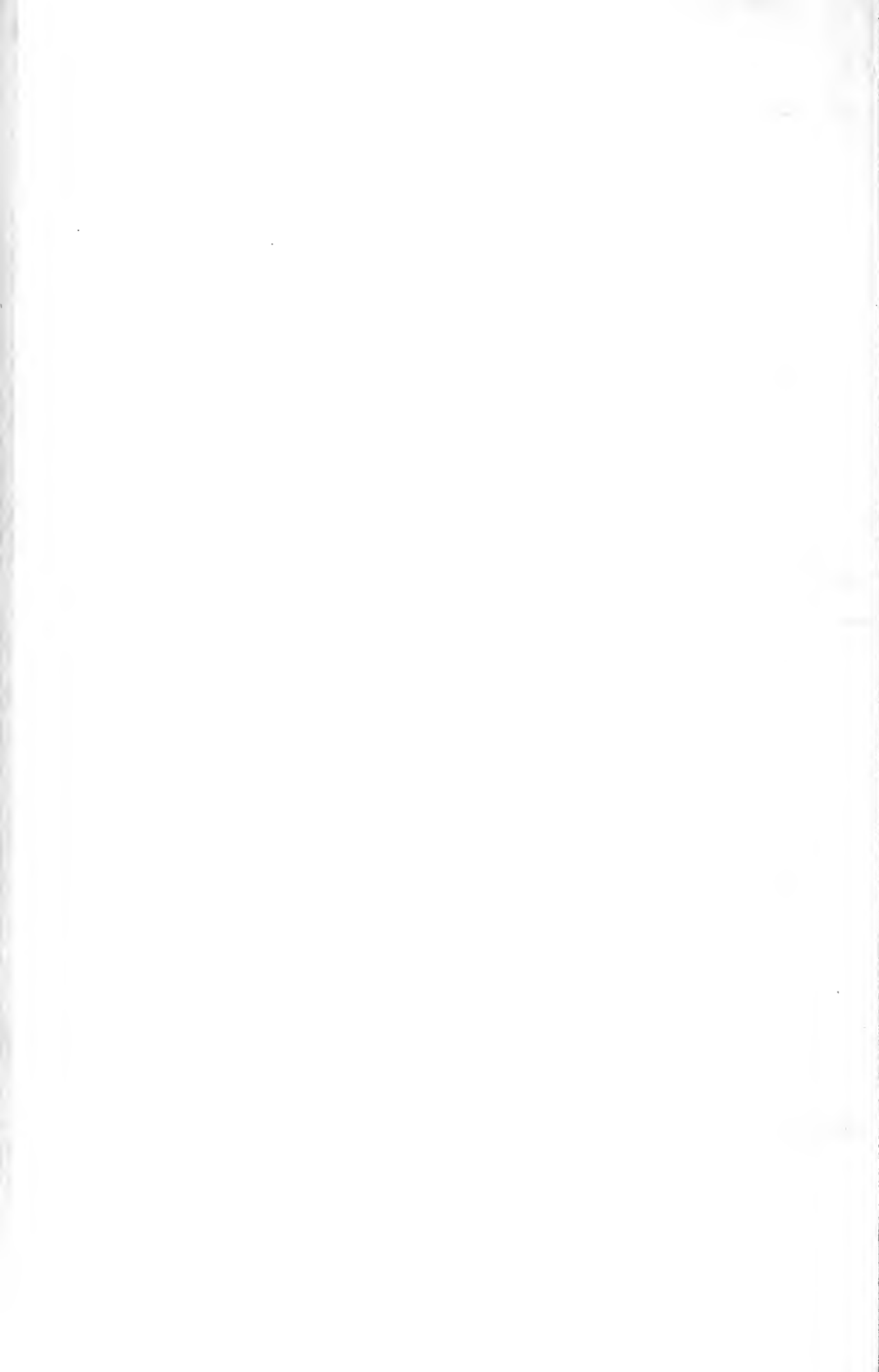
Conc. = 66

Impact = 49

Total 288

Sidewalk = 133

Design Moment = 3790 fk

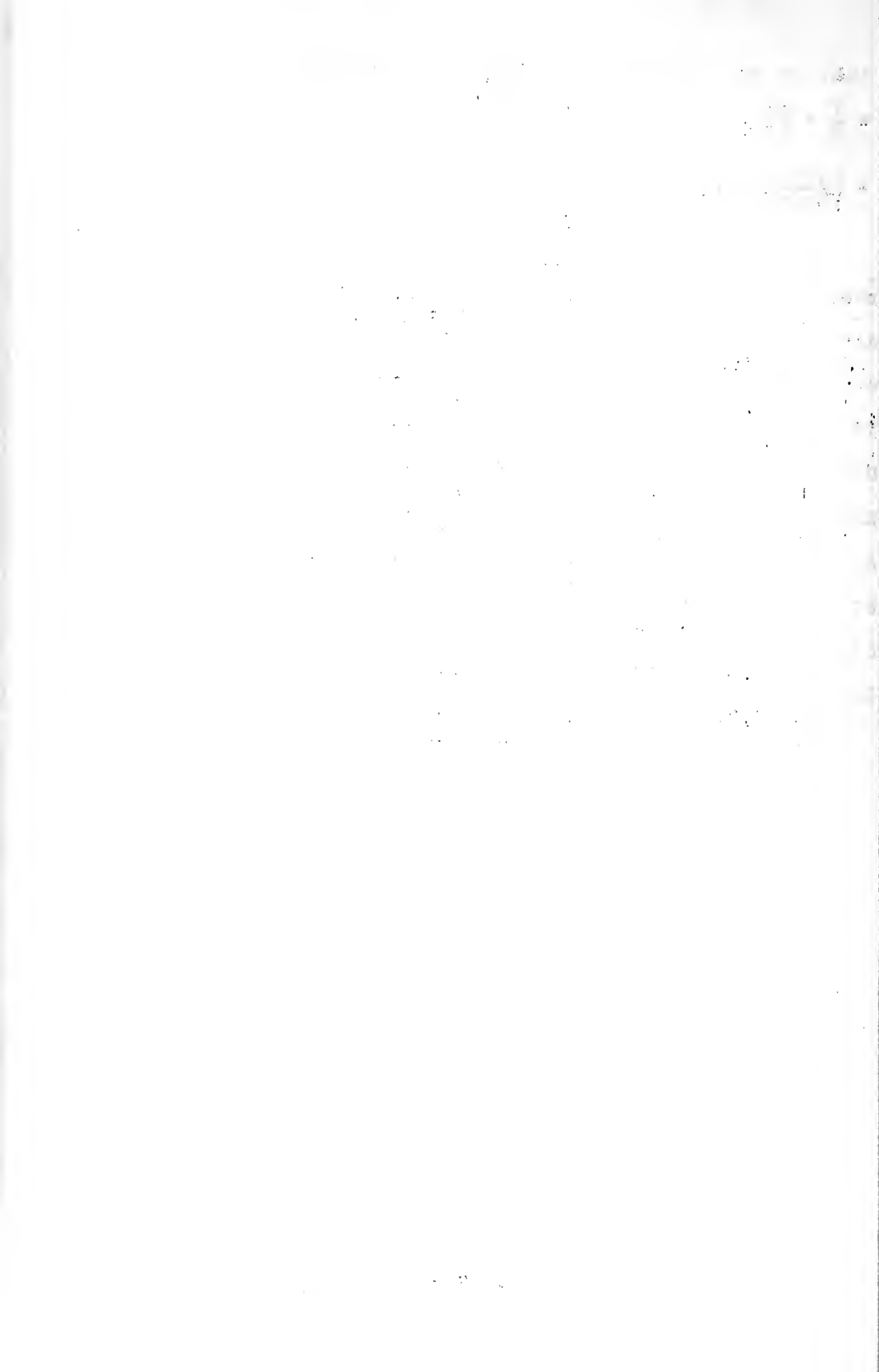


Determination of K values for second computations

$$K = \frac{I}{L} = \frac{Mc}{fL} \quad \text{Assuming } C = 15''$$

$$K = \frac{Nx15x12}{20xLx12} \quad \text{or} \quad K = .75 \frac{M}{L}$$

| Member | M | L | .75M/L = K |
|--------|--------|----|------------|
| AA' | 7362 | 35 | 160 |
| BB' | 11,745 | 38 | 232 |
| CC' | 7,243 | 40 | 136 |
| DD' | 4,064 | 41 | 74 |
| EE' | 2,593 | 41 | 47 |
| AB | 7,958 | 30 | 200 |
| BC | 5,360 | 30 | 134 |
| CD | 3,548 | 30 | 90 |
| DE | 3,790 | 30 | 95 |



Influence Line Computations - Second Set

Load at B

Panel 1

$$-Q_A = \frac{(.0942 \times 160 - 200)(.0866 \times 26.25 - .875 \times 30)}{2(2 - .0866)200} = 0$$

$$-Q_B = \frac{(.875 \times 30 - .0866 \times 26.25)}{2(2 - .0866)} = 6.28$$

$$Q_{R1} = \frac{(.875 \times 30 - .0866 \times 26.25)}{2(2 - .0866)200} = 0.31$$

Panel 2

$$-Q_B = \frac{(.0463 \times 232 - 134)(.0443 \times 22.5 + .125 \times 30)}{2(2 - .0443)134} = -1.11$$

$$-Q_C = \frac{(-.125 \times 30 - .0443 \times 22.5)}{2(2 - .0443)} = -1.21$$

$$Q_{R2} = \frac{(-.125 \times 30 - .0443 \times 22.5)}{2(2 - .0443)134} = -.009$$

Panel 3

$$-Q_C = \frac{(.0507 \times 136 - 90)(.0482 \times 18.75 + .125 \times 30)}{2(2 - .0482)90} = -1.10$$

$$-Q_D = \frac{(-.125 \times 30 - .0482 \times 18.75)}{2(2 - .0482)} = -1.19$$

$$Q_{R3} = \frac{(-.125 \times 30 - .0482 \times 18.75)}{2(2 - .0482)90} = -0.13$$

Panel 4

$$-Q_D = \frac{-95(.125 \times 30)}{4 \times 95} = -.94$$

$$-Q_E = \frac{(-.125 \times 30)}{4} = -.94$$

$$Q_{R4} = \frac{(-.125 \times 30)}{4 \times 95} = -.01$$

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Panel 5

$$-Q_E = \frac{-1.25 \times 30}{4} = -.94$$

$$-Q_F = \frac{-1.25 \times 30}{4} = -.94$$

$$Q_{E5} = \frac{-1.25 \times 30}{4 \times 95} = -.0099$$

Panel 6

$$-Q_G = \frac{(.0507 \times 136 - 90)(-.0482 \times 11.25 + .125 \times 30)}{2(2 - .0482)90} = -.76$$

$$-Q_F = \frac{(-1.25 \times 30 + .0482 \times 11.25)}{2(2 - .0482)} = -.82$$

$$Q_{R6} = \frac{(-.125 \times 30 + .0482 \times 11.25)}{2(2 - .0482)90} = -.0091$$

Panel 7

$$-Q_H = \frac{(.0463 \times 134 - 134)(-.0443 \times 7.5 + .125 \times 30)}{2(2 - .0443)134} = -.81$$

$$-Q_G = \frac{(-.125 \times 30 + .0443 \times 7.5)}{2(2 - .0443)} = -.87$$

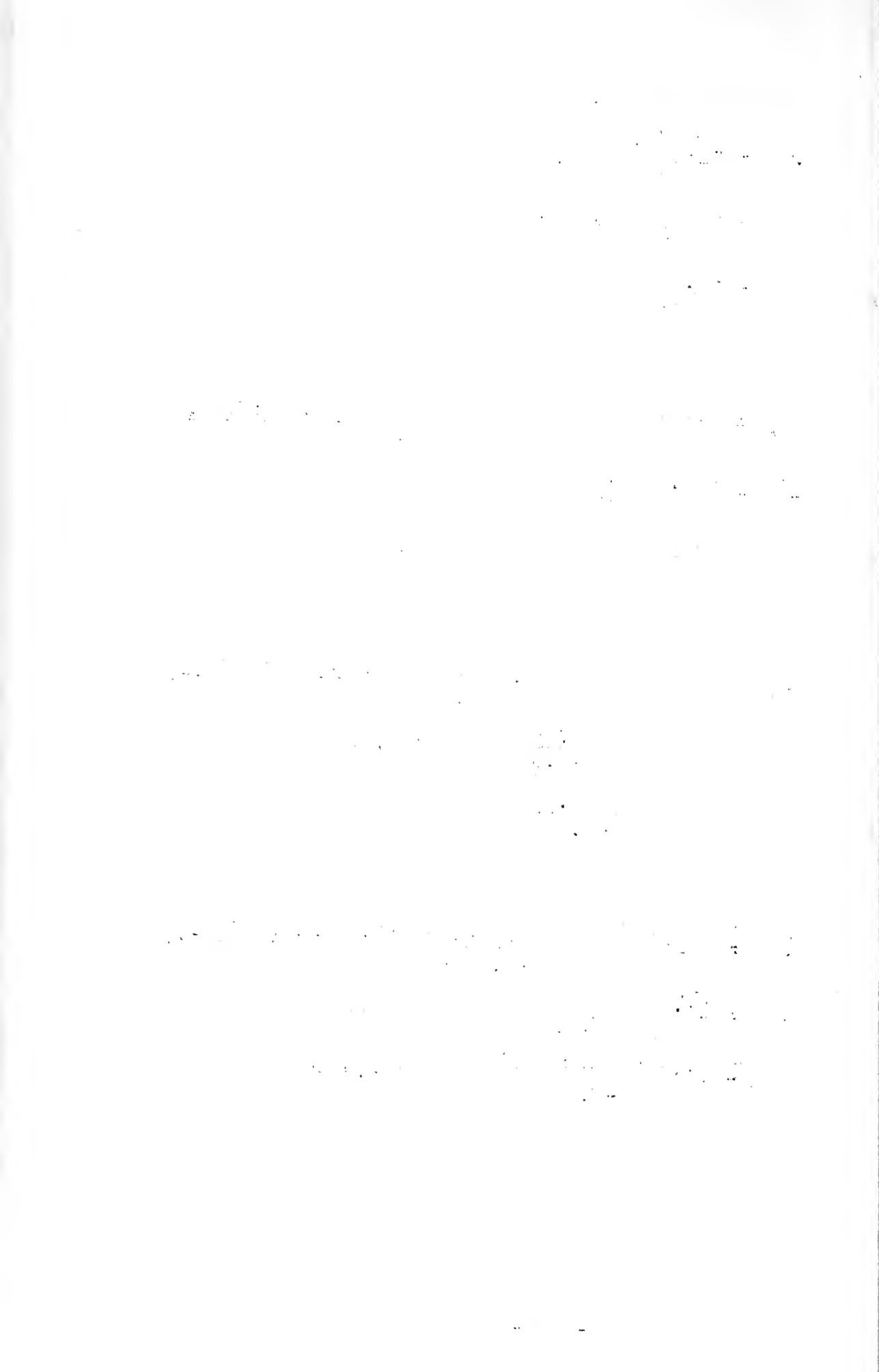
$$Q_{R7} = \frac{(-.125 \times 30 + .0443 \times 7.5)}{2(2 - .0443)134} = -.0065$$

Panel 8

$$-Q_I = \frac{(.0942 \times 160 - 200)(-.0866 \times 3.75 + .125 \times 30)}{2(2 - .0866)200} = -.83$$

$$-Q_H = \frac{(-.125 \times 30 + .0866 \times 3.75)}{2(2 - .0866)} = -.90$$

$$Q_{R8} = \frac{(-.125 \times 30 + .0866 \times 3.75)}{2(2 - .0866)200} = -.0045$$



Panel 1

$$-Q_A = \frac{(.0942 \times 160 - 200)(.0866 \times 22.5 - .75 \times 30)}{2(2 - .0866)200} = 4.98$$

$$-Q_B = \frac{(.75 \times 30 - .0866 \times 22.5)}{2(2 - .0866)} = 5.38$$

$$Q_{R1} = \frac{(.75 \times 30 - .0866 \times 22.5)}{2(2 - .0866)200} = 0.27$$

Panel 2

$$-Q_B = \frac{(.0463 \times 232 - 134)(.0443 \times 45 - .75 \times 30)}{2(2 - .0443)134} = 4.82$$

$$-Q_C = \frac{(.75 \times 30 - .0443 \times 45)}{2(2 - .0443)} = 5.24$$

$$Q_{R2} = \frac{(.75 \times 30 - .0443 \times 45)}{2(2 - .0443)134} = 0.39$$

Panel 3

$$-Q_C = \frac{(.0507 \times 136 - 90)(.0482 \times 37.5 + .25 \times 30)}{2(2 - .0482)90} = -2.20$$

$$-Q_D = \frac{(-.25 \times 30 - .0482 \times 37.5)}{2(2 - .0482)} = -2.39$$

$$Q_{R3} = \frac{-.25 \times 30 - .0482 \times 37.5}{2(2 - .0482)90} = -.027$$

Panel 4

$$-Q_D = \frac{(-95)(.25 \times 30)}{4 \times 95} = -1.87$$

$$-Q_E = \frac{(-.25 \times 30)}{4} = -1.87$$

$$Q_{R4} = \frac{-.25 \times 30}{4 \times 95} = -.020$$

1. The first part of the document is a list of the names of the persons who have been appointed to the various offices of the Board of Directors of the Corporation.

2. The second part of the document is a list of the names of the persons who have been appointed to the various offices of the Board of Directors of the Corporation.

3. The third part of the document is a list of the names of the persons who have been appointed to the various offices of the Board of Directors of the Corporation.

4. The fourth part of the document is a list of the names of the persons who have been appointed to the various offices of the Board of Directors of the Corporation.

5. The fifth part of the document is a list of the names of the persons who have been appointed to the various offices of the Board of Directors of the Corporation.

6. The sixth part of the document is a list of the names of the persons who have been appointed to the various offices of the Board of Directors of the Corporation.

7. The seventh part of the document is a list of the names of the persons who have been appointed to the various offices of the Board of Directors of the Corporation.

8. The eighth part of the document is a list of the names of the persons who have been appointed to the various offices of the Board of Directors of the Corporation.

9. The ninth part of the document is a list of the names of the persons who have been appointed to the various offices of the Board of Directors of the Corporation.

10. The tenth part of the document is a list of the names of the persons who have been appointed to the various offices of the Board of Directors of the Corporation.

11. The eleventh part of the document is a list of the names of the persons who have been appointed to the various offices of the Board of Directors of the Corporation.

12. The twelfth part of the document is a list of the names of the persons who have been appointed to the various offices of the Board of Directors of the Corporation.

Panel 5

$$-Q_E = -1.88$$

$$-Q_F = -1.88$$

$$Q_{R5} = -.020$$

Panel 6

$$-Q_F = -1.64$$

$$-Q_G = -1.52$$

$$Q_{R6} = -.018$$

Panel 7

$$-Q_G = -1.74$$

$$-Q_H = -1.62$$

$$Q_{R7} = -.013$$

Panel 8

$$-Q_H = -1.80$$

$$-Q_I = -1.66$$

$$Q_{R8} = -.0090$$

Load at D

Panel 1

$$-Q_A = \frac{(.0942 \times 160 - 200)(.0866 \times 18.75 - .625 \times 30)}{2(2 - .0866)200} = 4.15$$

$$-Q_B = \frac{.625 \times 30 - .0866 \times 18.75}{2(2 - .0866)} = 4.49$$

$$Q_{R1} = \frac{.625 \times 30 - .0866 \times 18.75}{2(2 - .0866)200} = .022$$

Panel 2

$$-Q_B = \frac{(.0463 \times 232 - 134)(.0443 \times 37.5 - .625 \times 30)}{2(2 - .0443)134} = 4.02$$

$$-Q_C = \frac{(.625 \times 30 - .0443 \times 37.5)}{2(2 - .0443)} = 4.36$$

$$Q_{R2} = \frac{(.625 \times 30 - .0443 \times 37.5)}{2(2 - .0443)134} = .033$$

Panel 3

$$-Q_C = \frac{(.0507 \times 136 - 90)(.0482 \times 56.25 - .625 \times 30)}{2(2 - .0482)90} = 3.80$$

$$-Q_D = \frac{(.625 \times 30 - .0482 \times 56.25)}{2(2 - .0482)} = 4.12$$

$$Q_{R3} = \frac{(.625 \times 30 - .0482 \times 56.25)}{2(2 - .0482)90} = .046$$

Panel 4

$$-Q_D = \frac{(-.95)(.375 \times 30)}{4 \times 95} = -2.81$$

$$-Q_E = \frac{(-.375 \times 30)}{4} = -2.81$$

$$Q_{R4} = \frac{(-.375 \times 30)}{4 \times .95} = .030$$

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Panel 5

$$-Q_E = -2.82$$

$$-Q_F = -2.82$$

$$Q_{R5} = -.030$$

Panel 6

$$-Q_F = -2.46$$

$$-Q_G = -2.28$$

$$Q_{R6} = -0.27$$

Panel 7

$$-Q_G = -2.61$$

$$-Q_H = -2.43$$

$$Q_{R7} = -.020$$

Panel 8

$$-Q_H = -2.70$$

$$-Q_I = -2.49$$

$$Q_{R8} = -.014$$

Load at E

Panel 1

$$-Q_A = \frac{(.0942 \times 160 - 200)(.0866 \times 15 - .5 \times 30)}{2(2 - .0866)200} = 3.32$$

$$-Q_B = \frac{(.5 \times 30 - .0866 \times 15)}{2(2 - .0866)} = 3.59$$

$$Q_{R1} = \frac{(.5 \times 30 - .0866 \times 15)}{2(2 - .0866)200} = .018$$

Panel 2

$$-Q_B = \frac{(.0463 \times 132 - 134)(.0443 \times 30 - .5 \times 30)}{2(2 - .0443)134} = 3.22$$

$$-Q_C = \frac{(.5 \times 30 - .0443 \times 30)}{2(2 - .0443)} = 3.49$$

$$Q_{R2} = \frac{(.5 \times 30 - .0443 \times 30)}{2(2 - .0443)134} = .026$$

Panel 3

$$-Q_C = \frac{(.0507 \times 136 - 90)(.0482 \times 45 - .5 \times 30)}{2(2 - .0482)90} = 3.04$$

$$-Q_D = \frac{(.5 \times 30 - .0482 \times 45)}{2(2 - .0482)} = 3.30$$

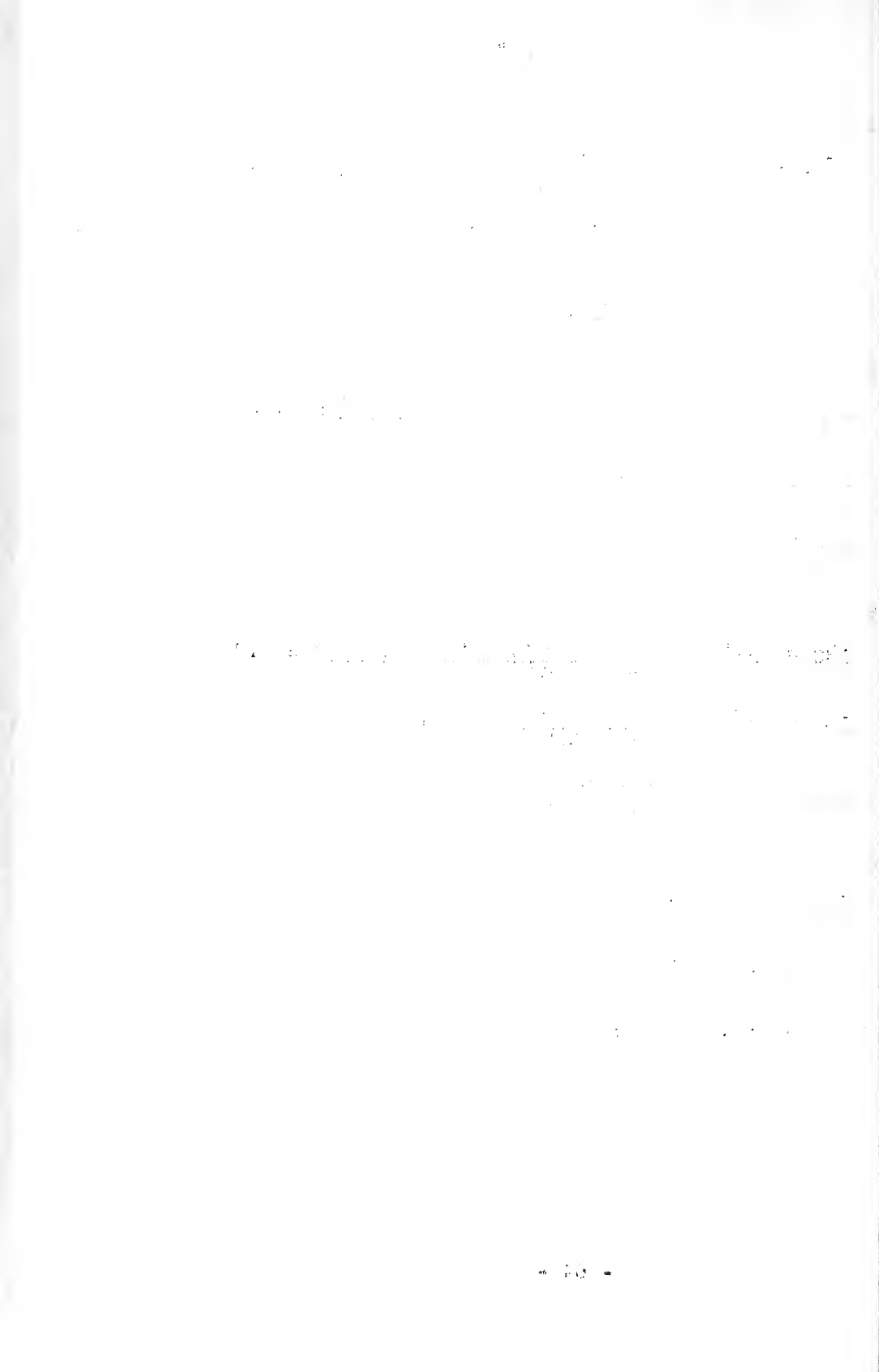
$$Q_{R3} = \frac{(.5 \times 30 - .0482 \times 45)}{2(2 - .0482)90} = .037$$

Panel 4

$$-Q_D = \frac{(-95)(-.5 \times 30)}{4 \times 95} = 3.75$$

$$-Q_E = \frac{(.5 \times 30)}{4} = 3.75$$

$$Q_{R4} = \frac{.5 \times 30}{4 \times 95} = .040$$



Panel 5

$$-Q_E = -3.78$$

$$-Q_F = -3.78$$

$$Q_{R5} = -.040$$

Panel 6

$$-Q_E = -3.28$$

$$-Q_G = -3.04$$

$$Q_{R6} = -.036$$

Panel 7

$$-Q_G = -3.48$$

$$-Q_H = -3.24$$

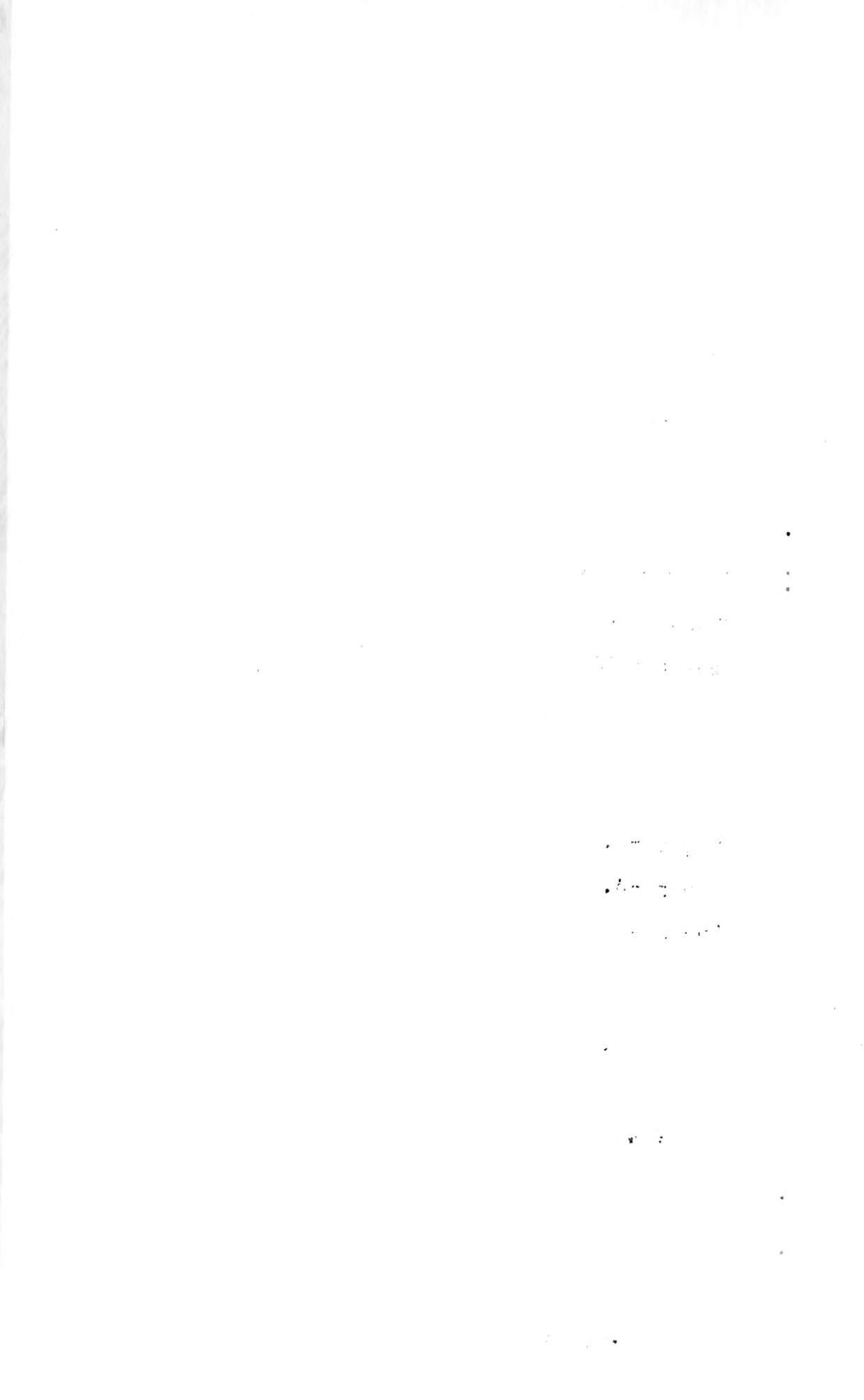
$$Q_{R7} = -.026$$

Panel 8

$$-Q_H = -3.60$$

$$-Q_I = -3.32$$

$$Q_{R8} = .018$$



Panel Constant Computations Load at B

Panel 1

$$\left[1.5 \times 160 + 200 + \frac{(3 - .0866)(.0942 \times 160 - 200)}{2(2 - .0866)} \right] A + \left[\frac{200}{2} + \frac{(3 - .1734)(.0942 \times 160 - 200)}{2(2 - .0866)} \right] B = 5.82$$

$$299A - 37B = 5.82$$

$$\left[200 + 1.5 \times 232 - \frac{(3 - .1732)200}{2(2 - .0866)} \right] B + \left[\frac{200}{2} - \frac{(3 - .0866)200}{2(2 - .0866)} \right] = 6.28$$

$$400B - 52A = 6.28$$

Solving Simultaneously: $A = .022$ $B = .019$

$$R_1 = \frac{(3 - .0866)(.022) + (3 - .1732)(.019)}{2(2 - .0866)} + .031 = .062$$

Panel 2

$$\left[1.5 \times 232 + 134 + \frac{(3 - .0443)(.0463 \times 232 - 134)}{2(2 - .0443)} \right] B + \left[\frac{134}{2} + \frac{(3 - .0886)(.0463 \times 232 - 134)}{2(2 - .0443)} \right] C = -1.11$$

$$\left[134 + 1.5 \times 136 - \frac{(3 - .0886)134}{2(2 - .0443)} \right] C + \left[\frac{134}{2} - \frac{(3 - .0443)134}{2(2 - .0443)} \right] B = -1.21$$

$$238C - 34B = -1.21$$

Solving Simultaneously: $B = -.003$ $C = -.005$

$$R_2 = \frac{(3 - .0443)(-.003) + (3 - .0886)(-.005)}{2(2 - .0443)} - .009 = -.015$$

1944 = 1945

1946

1947 = 1948

1949

1950 = 1951

1952 = 1953

1954 = 1955

1956 = 1957

1958 = 1959

Panel 3

$$.5x136 + 90 + \frac{(3-.0482)(.0507x136-90)}{2(2-.0482)} \Bigg] C \Bigg[\frac{90 + (3-.0964)(.0507x136-90)}{2} \frac{1}{2(2-.0482)} \Bigg]$$

$$D = -1.10$$

$$231C - 17D = 1.10$$

$$0 + 1.5x74 - \frac{(3-.0964)90}{2(2-.0482)} \Bigg] D + \frac{90 - (3-.0482)90}{2} \Bigg] C = -1.19$$

$$134D - 23C = -1.19$$

Solving Simultaneously: $C = -.0055; D = -.0098$

$$R_3 = \frac{(3-.0482)(-.0055) + (3-.0964)(-.0098)}{2(2-.0482)} - .013 = -.024$$

Panel 4

$$.5x74 + 95 + \frac{(3)(0-95)}{4} \Bigg] D + \frac{95 + (3)(0-95)}{2} \Bigg] E = -.94$$

$$135D - 24E = -.94$$

$$+ 1.5x47 - \frac{(3)95}{4} \Bigg] E + \frac{95 - (3)95}{2} \Bigg] D = -.94$$

$$94E - 24D = -.94$$

Solving Simultaneously $D = -.0092; E = -.012$

$$R_4 = \frac{3(-.0092) + 3(-.012)}{4} - .01 = -.026$$

1975

100

• • • • •

Figure 1. The effect of the concentration of the *Agrobacterium* suspension on the transformation efficiency of *Agrobacterium* strains. The number of transformed cells was determined by the number of colonies growing on the selective medium. The results are the mean of three independent experiments. Error bars represent standard deviation.

the 1990s, the number of people in the world who are undernourished has declined from 1.1 billion to 800 million. The number of people who are malnourished has declined from 1.5 billion to 1 billion. The number of people who are obese has increased from 100 million to 300 million. The number of people who are overweight has increased from 100 million to 300 million. The number of people who are obese and overweight has increased from 100 million to 300 million. The number of people who are obese and overweight has increased from 100 million to 300 million.

1. *Chlorophyll a* and *Chlorophyll b* were determined by the method of Lichtenthal and Whistler (1973).

[illegible]

... ..

1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 2680, 26

Panel 5

$$135E - 24F = -.94$$

$$-24E + 94F = -.94$$

$$E = -.012$$

$$F = -.0092$$

$$R_5 = \frac{3}{4} (-.0092 - .012) - .0099 = -.026$$

Panel 6

$$134F - 23G = -.82$$

$$-17F + 231G = -.76$$

$$F = -.0068$$

$$G = -.0039$$

$$R_6 = \frac{-2.95 \times .0039 - 2.90 \times .0068}{3.90} - .0091 = -.0173$$

Panel 7

$$238G - 34H = -.87$$

$$-25G + 389H = -.81$$

$$G = -.0040$$

$$H = -.0023$$

$$R_7 = \frac{-2.96 \times .0023 - 2.91 \times .0040}{3.91} - .0065 = -.0112$$

Panel 8

$$400H - 52I = -.90$$

$$-37H + 299I = -.83$$

$$H = -.0027$$

$$I = -.0031$$

$$R_8 = \frac{-2.91 \times .0031 - 2.83 \times .0027}{3.83} - .0045 = -.0088$$

1870

1870
1871
1872
1873
1874

1875 1876 1877 1878 1879 1880 1881 1882 1883 1884 1885 1886 1887 1888 1889 1890 1891 1892 1893 1894 1895 1896 1897 1898 1899 1900

1901
1902
1903
1904
1905

1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000

2001

Panel Constant Computations - Load at C

Panel 1

$$299A - 37B = 4.98$$

$$-52A + 400B = 5.38$$

$$A = .019, B = .016$$

$$R_1 = \frac{2.91(.019) + 2.83(.016)}{2(1.91)} + .027 = .053$$

Panel 2

$$389B - 25C = 4.82$$

$$-34B + 238C = 5.24$$

$$B = .014, C = .024$$

$$R_2 = \frac{2.96(.014) + (2.91)(.024)}{3.92} + .039 = .067$$

Panel 3

$$231C - 17D = -2.20$$

$$-23C + 134D = -2.39$$

$$C = -.011, D = -.020$$

$$R_3 = \frac{2.95(-.011) + 2.90(-.020)}{3.90} + (-.027) = -.050$$

Panel 4

$$135D - 24E = -1.87$$

$$-24D + 94E = -1.87$$

$$D = -.018, E = -.025$$

$$R_4 = \frac{3(-.018) + 3(-.025)}{4} + (-.020) = -.052$$

Panel 5

$$E = -.024$$

$$F = -.018$$

$$R_5 = -.052$$

Panel 6

$$F = -.014$$

$$G = -.0078$$

$$R_6 = -.034$$

Panel 7

$$G = -.0080$$

$$H = -.0046$$

$$R_7 = -.022$$

Panel 8

$$H = -.0054$$

$$I = -.0062$$

$$R_8 = -.018$$

Panel Constant Computations - Load at PP3

Panel 1

$$299A - 37B = 4.15$$

$$-52A + 400B = 4.49$$

Solving Simultaneously; $A = .016$, $B = .013$

$$R_1 = \frac{2.91(.016) + 2.83(.013)}{3.82} + .022 = .044$$

Panel 2

$$389B - 25C = 4.02$$

$$-34B + 238C = 4.36$$

Solving Simultaneously; $B = .012$, $C = .020$

$$R_2 = \frac{2.96(.012) + 2.91(.020)}{3.92} + .033 = .057$$

Panel 3

$$231C - 17D = 3.80$$

$$-23C + 134D = 4.12$$

Solving Simultaneously; $C = .019$, $D = .034$

$$R_3 = \frac{2.95(.019) + 2.90(.034)}{3.90} + .046 = .086$$

Panel 4

$$135D - 24E = -2.81$$

$$-24D + 94E = -2.81$$

Solving Simultaneously; $D = -.027$, $E = -.037$

$$R_4 = \frac{3(-.027) + 3(-.037)}{4} + (-.03) = -.078$$

1. The first part of the paper is devoted to a discussion of the

main results of the theory of the

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Panel 5

$$E = -.036$$

$$F = -.028$$

$$R_5 = -.078$$

Panel 6

$$F = -.020$$

$$G = -.012$$

$$R_6 = -.051$$

Panel 7

$$G = -.012$$

$$H = -.0069$$

$$R_7 = -.033$$

Panel 8

$$H = -.0081$$

$$I = -.0093$$

$$R_8 = -.026$$

Panel Constant Computations - Load at E

Panel 1

$$299A - 37B = 3.32$$

$$-52A + 400B = 3.59$$

$$A = .012, B = .011$$

$$R_1 = \frac{2.91(.012) + 2.83(.011)}{3.82} + .018 = .035$$

Panel 2

$$389B - 25C = 3.22$$

$$-34B + 238C = 3.49$$

$$B = .009, C = .016$$

$$R_2 = \frac{2.96(.009) + 2.91(.016)}{3.92} + .026 = .045$$

Panel 3

$$231C - 17D = 3.04$$

$$-23C + 134D = 3.30$$

$$C = .015, D = .027$$

$$R_3 = \frac{2.95(.015) + 2.90(.027)}{3.90} + .037 = .069$$

Panel 4

$$135D - 24E = 3.75$$

$$-24D + 94E = 3.75$$

$$D = .036, E = .049$$

$$R_4 = \frac{3(.036) + 3(.049)}{4} + .040 = .10$$

1911

1912

1913

1914

1915

1916

1917

1918

Panel 5

$$E = -.048$$

$$F = -.037$$

$$R_5 = -.104$$

Panel 6

$$F = -.027$$

$$G = -.016$$

$$R_6 = -.068$$

Panel 7

$$G = -.016$$

$$H = -.0092$$

$$R_7 = -.044$$

Panel 8

$$H = -.011$$

$$I = -.012$$

$$R_8 = -.035$$

Moment Determination

Load at PPl

$$M = K(A + \frac{B}{2} - R) \quad FM_{AB}$$

Panel 1

$$M_{AB} = 200(.022 + \frac{.019}{2} - .062) \quad M_{AB} = -6.0$$

$$M_{BA} = 200(.019 + \frac{.022}{2} - .062) \quad M_{BA} = -6.4$$

Panel 2

$$M_{BC} = 134(-.003 - \frac{.005}{2} + .015) \quad M_{BC} = +1.21$$

$$M_{CB} = 134(-.005 - \frac{.003}{2} + .015) \quad M_{CB} = +1.07$$

Panel 3

$$M_{CD} = 90(-.0055 - \frac{.0098}{2} + .024) \quad M_{CD} = +1.26$$

$$M_{DC} = 90(-.0098 - \frac{.0055}{2} + .024) \quad M_{DC} = +0.99$$

Panel 4

$$M_{DE} = 95(-.0092 - \frac{.012}{2} + .026) \quad M_{DE} = +1.05$$

$$M_{ED} = 95(-.012 - \frac{.0092}{2} + .026) \quad M_{ED} = +.86$$

Panel 5

$$M_{EF} = 2.58$$

$$M_{FE} = 2.97$$

Panel 6

$$M_{FG} = 2.16$$

$$M_{GF} = 2.70$$

Panel 7

$$M_{GH} = 2.40$$

$$M_{HG} = 2.82$$

Panel 8

$$M_{HI} = 2.76$$

$$M_{IH} = 2.58$$

1875

1876

1877

1878

1879

1880

1881

1882

1883

1884

1885

Load at PP2

Panel 1

$$M_{AB} = 200\left(.019 + \frac{.016}{2} - .053\right) \quad M_{AB} = -5.20$$

$$M_{BA} = 200\left(.016 + \frac{.019}{2} - .053\right) \quad M_{BA} = -5.40$$

Panel 2

$$M_{BC} = 134\left(.014 + \frac{.024}{2} - .067\right) \quad M_{BC} = -5.49$$

$$M_{CB} = 134\left(.024 + \frac{.014}{2} - .067\right) \quad M_{CB} = -4.82$$

Panel 3

$$M_{CD} = 90\left(-.011 - \frac{.020}{2} + .050\right) \quad M_{CD} = +2.61$$

$$M_{DC} = 90\left(-.020 - \frac{.011}{2} + .050\right) \quad M_{DC} = +2.16$$

Panel 4

$$M_{DE} = 95\left(-.018 - \frac{.025}{2} + .052\right) \quad M_{DE} = +2.09$$

$$M_{ED} = 95\left(-.025 - \frac{.018}{2} + .052\right) \quad M_{ED} = +1.71$$

Panel 5

$$M_{EF} = 3.44$$

$$M_{FE} = 3.96$$

Panel 6

$$M_{FG} = 2.88$$

$$M_{GF} = 3.60$$

Panel 7

$$M_{GH} = 3.20$$

$$M_{HG} = 3.76$$

Panel 8

$$M_{HI} = 3.68$$

$$M_{IH} = 3.44$$

1871

1872

1873

1874

1875

1876

1877

1878

Load at PF3

Panel 1

$$M_{AB} = 200\left(.016 + \frac{.013}{2} - .044\right) \quad M_{AB} = -4.40$$

$$M_{BA} = 200\left(.013 + \frac{.016}{2} - .044\right) \quad M_{BA} = -4.60$$

Panel 2

$$M_{BC} = 134\left(.012 + \frac{.020}{2} - .057\right) \quad M_{BC} = -4.69$$

$$M_{CB} = 134\left(.020 + \frac{.012}{2} - .057\right) \quad M_{CB} = -4.15$$

Panel 3

$$M_{CD} = 90\left(.019 + \frac{.034}{2} - .086\right) \quad M_{CD} = -4.50$$

$$M_{DC} = 90\left(.034 + \frac{.019}{2} - .086\right) \quad M_{DC} = -3.78$$

Panel 4

$$M_{DE} = 95\left(-.027 - \frac{.037}{2} + .078\right) \quad M_{DE} = 3.14$$

$$M_{ED} = 95\left(-.037 - \frac{.027}{2} + .078\right) \quad M_{ED} = 2.56$$

Panel 5

$$M_{EF} = 95\left(-.012 - \frac{.0092}{2} + .026\right) \quad M_{EF} = .86$$

$$M_{FE} = 95\left(-.0092 - \frac{.012}{2} + .026\right) \quad M_{FE} = .99$$

Panel 6

$$M_{FG} = 90\left(-.0068 - \frac{.0039}{2} + .017\right) \quad M_{FG} = .72$$

$$M_{GF} = 90\left(-.0039 - \frac{.0068}{2} + .017\right) \quad M_{GF} = .90$$

Panel 7

$$M_{GH} = 134\left(-.0040 - \frac{.0023}{2} + .011\right) \quad M_{GH} = .80$$

$$M_{HG} = 134\left(-.0023 - \frac{.0040}{2} + .011\right) \quad M_{HG} = .94$$

Panel 8

$$M_{HI} = 200\left(-.0027 - \frac{.0031}{2} + .0088\right) \quad M_{HI} = .92$$

$$M_{IH} = 200\left(-.0031 - \frac{.0027}{2} + .0088\right) \quad M_{IH} = .86$$

Load at PP4

Panel 1

$$M_{AB} = 200\left(.012 + \frac{.011}{2} - .035\right)$$

$$M_{AB} = -3.40$$

$$M_{BA} = 200\left(.011 + \frac{.012}{2} - .035\right)$$

$$M_{BA} = -3.60$$

Panel 2

$$M_{BC} = 134\left(.009 + \frac{.016}{2} - .045\right)$$

$$M_{BC} = -3.75$$

$$M_{CB} = 134\left(.016 + \frac{.009}{2} - .045\right)$$

$$M_{CB} = -3.35$$

Panel 3

$$M_{CD} = 90\left(.015 + \frac{.027}{2} - .069\right)$$

$$M_{CD} = -3.69$$

$$M_{DC} = 90\left(.027 + \frac{.015}{2} - .069\right)$$

$$M_{DC} = -3.15$$

Panel 4

$$M_{DE} = 95\left(.036 + \frac{.049}{2} - 0.10\right)$$

$$M_{DE} = -3.80$$

$$M_{ED} = 95\left(.049 + \frac{.036}{2} - 0.10\right)$$

$$M_{ED} = -3.13$$

Panel 5

$$M_{EF} = 1.72$$

$$M_{FE} = 1.98$$

Panel 6

$$M_{FG} = 1.44$$

$$M_{GF} = 1.80$$

Panel 7

$$M_{GH} = 1.60$$

$$M_{HG} = 1.88$$

Panel 8

$$M_{HI} = 1.84$$

$$M_{IH} = 1.72$$

First Moment Corrections - Load at B

1 -

$$299A - 37B = 0$$

$$-52A + 400B = -1.21$$

$$A = -.00038$$

$$B = -.0031$$

$$R_1 = \frac{-2.91 \times .00038 - 2.83 \times .0031}{3.83} = -.0026$$

$$M_{AB} = 200(-.00038 - \frac{1}{2} \times .0031 + .0026) = 0.14$$

$$M_{BA} = 200(-.0031 - \frac{1}{2} \times .00038 + .0026) = -0.14$$

2 -

$$388B - 25C = 6.4$$

$$-34B + 238C = -1.26$$

$$B = .016$$

$$C = -.0030$$

$$R_2 = \frac{2.96 \times .016 - 2.91 \times .003}{3.91} = .0099$$

$$M_{BC} = 134(.016 - \frac{1}{2} \times .0030 - .0099) = 0.62$$

$$M_{CB} = 134(-.0030 + \frac{1}{2} \times .016 - .0099) = -0.66$$

3

$$271C - 17D = -1.07$$

$$-23C + 134D = -1.05$$

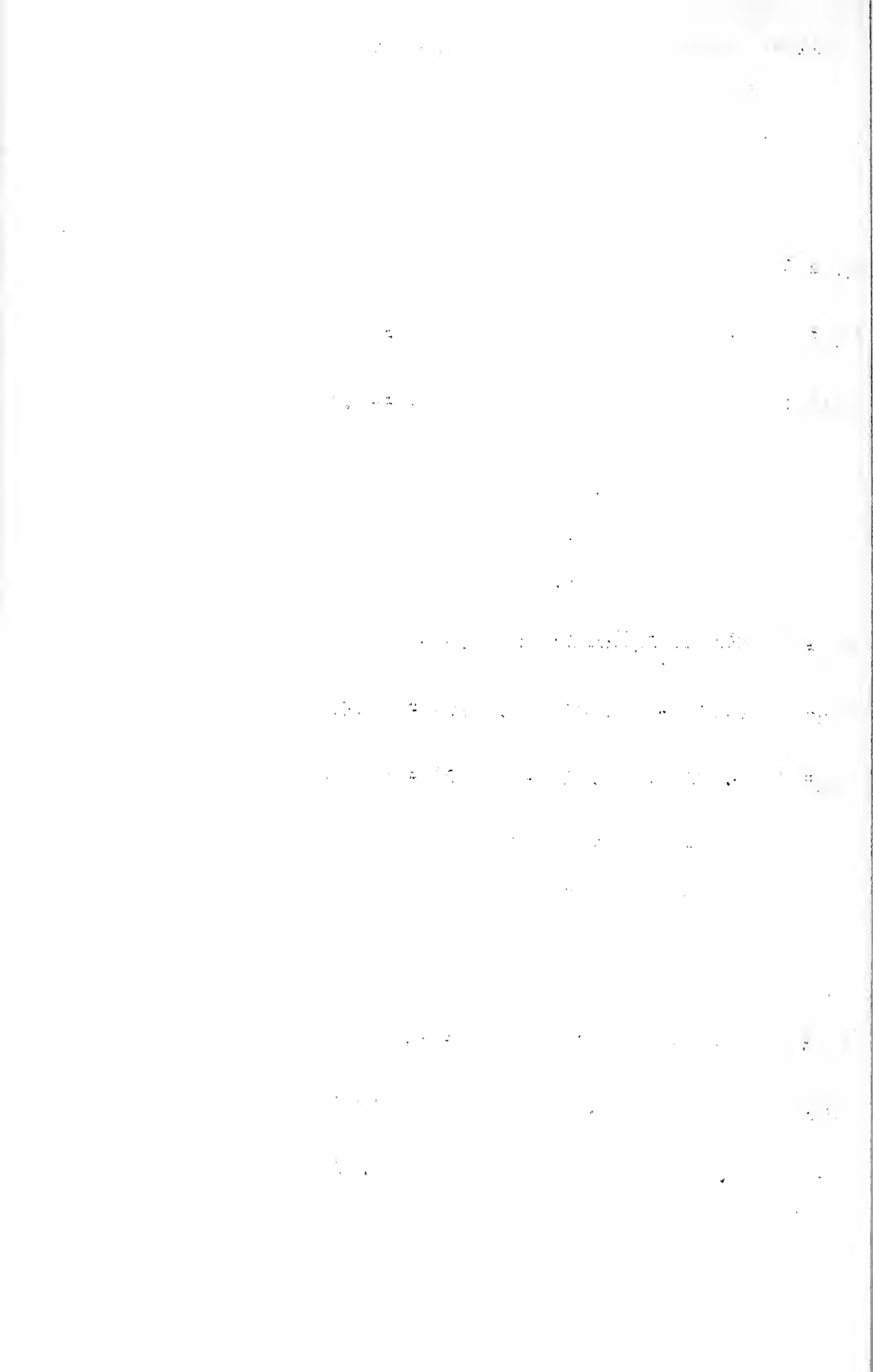
$$C = -.0055$$

$$D = -.0088$$

$$R_3 = \frac{-2.95 \times .0055 - 2.90 \times .0088}{3.90} = -.011$$

$$M_{CD} = 90(-.0055 - \frac{1}{2} \times .0088 + .011) = 0.072$$

$$M_{DC} = 90(-.0088 - \frac{1}{2} \times .0055 + .011) = -0.072$$



4 -

$$\begin{aligned} 94D - 24E &= -.99 \\ -24D + 135E &= -.86 \\ D &= -.013 \\ E &= -.0086 \end{aligned}$$

$$\begin{aligned} R_4 &= \frac{3}{4}(-.013 - .0086) = -.016 \\ M_{DE} &= 95(-.013 - \frac{1}{2}x.0086 + .016) = -.10 \\ M_{ED} &= 95(-.0086 - \frac{1}{2}x.013 + .016) = +.10 \end{aligned}$$

5 -

$$\begin{aligned} 135E - 24F &= -.86 \\ -24E + 94F &= -.72 \\ E &= -.0080 \\ F &= -.0097 \end{aligned}$$

$$\begin{aligned} R_5 &= \frac{3}{4}(-.0080 - .0097) = -.013 \\ M_{EF} &= 95(-.0080 - \frac{1}{2}x.0097 + .013) = .05 \\ M_{FE} &= 95(-.0097 - \frac{1}{2}x.0080 + .013) = -.04 \end{aligned}$$

6 -

$$\begin{aligned} 134F - 23G &= -.99 \\ -17F + 231G &= -.80 \\ F &= -.0079 \\ G &= -.0040 \end{aligned}$$

$$\begin{aligned} R_6 &= \frac{-2.90x.0079 - 2.95x.0040}{3.90} = -.0090 \\ M_{FG} &= 90(-.0079 - \frac{1}{2}x.0040 + .0090) = -.08 \\ M_{GF} &= 90(-.0040 - \frac{1}{2}x.0079 + .0090) = .09 \end{aligned}$$

7 -

$$238G - 34H = -.90$$

$$-25G + 388H = -.92$$

$$G = -.0040$$

$$H = -.0026$$

$$R_7 = \frac{-2.91 \times .0040 - 2.96 \times .0026}{3.91} = -.0049$$

$$M_{GH} = 134(-.0040 - \frac{1}{2} \times .0026 + .0049) = -.05$$

$$M_{HG} = 134(-.0026 - \frac{1}{2} \times .0040 + .0049) = .04$$

8 -

$$400H - 52I = -.94$$

$$-37H + 299I = 0.00$$

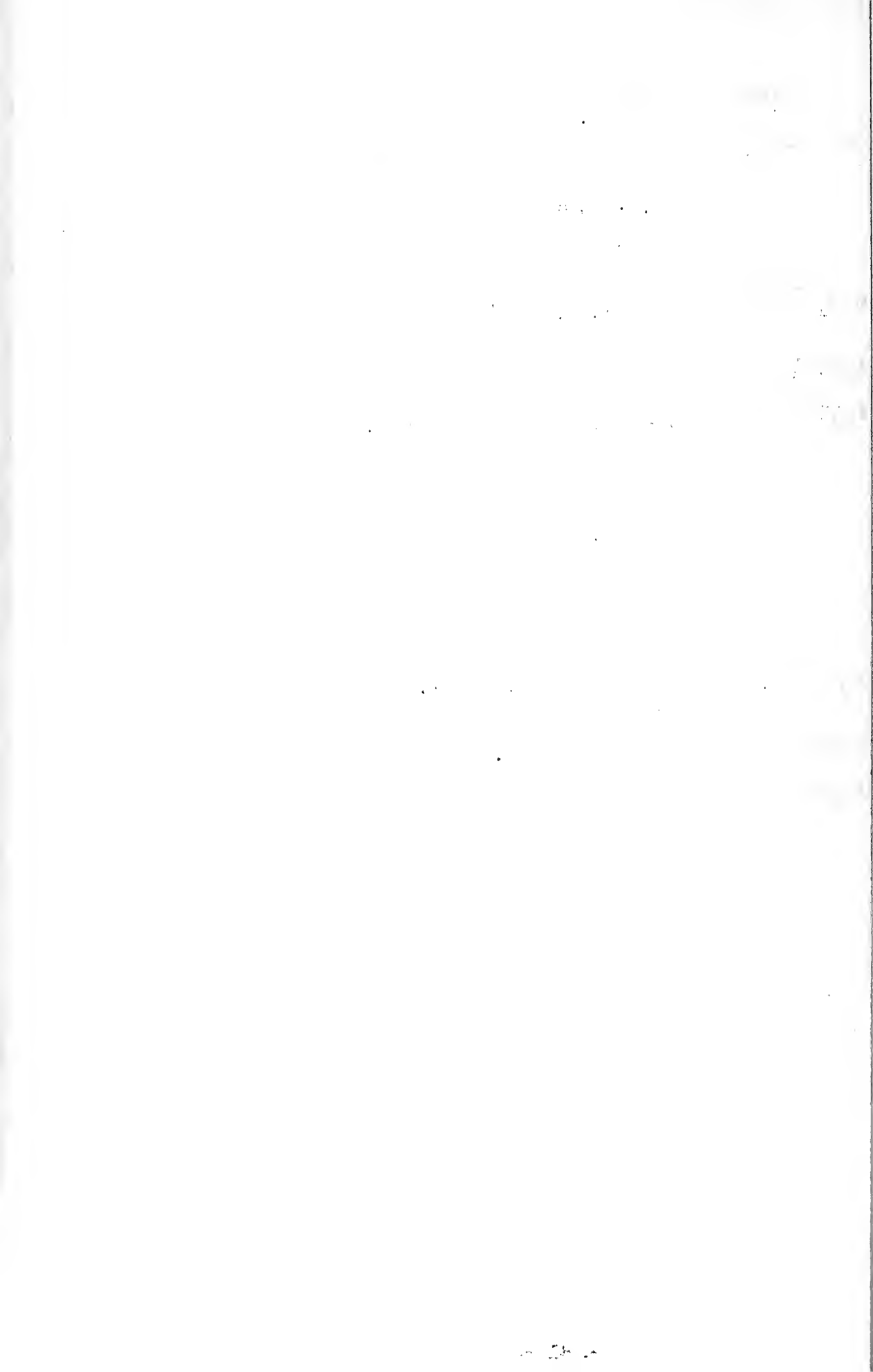
$$H = -.0024$$

$$I = -.0003$$

$$R_8 = \frac{-2.83 \times .0024 - 2.91 \times .0003}{3.83} = -.0020$$

$$M_{HI} = 200(-.0024 - \frac{1}{2} \times .0003 + .0020) = -0.10$$

$$M_{IH} = 200(-.0003 - \frac{1}{2} \times .0024 + .0020) = 0.10$$



Load at B

| Panel | 1 | | 2 | | 3 | | 4 | |
|----------|--------|-------|--------|--------|--------|--------|--------|--------|
| Joint | A | B | B | C | C | D | D | E |
| -Q | 5.82 | 6.28 | -1.11 | -1.21 | -1.10 | -1.19 | -.94 | -.94 |
| α | .022 | .019 | -.003 | -.005 | -.0055 | -.0098 | -.0092 | -.012 |
| R | .062 | | -.015 | | -.024 | | -.026 | |
| M' | -6.0 | -6.4 | 1.21 | 1.07 | 1.26 | 0.99 | 1.05 | 0.86 |
| -Q | 0.00 | -1.21 | 6.4 | -1.26 | -1.07 | -1.05 | -0.99 | -0.86 |
| α | -.0004 | .0031 | 0.16 | -.0030 | -.0055 | -.0088 | -.013 | -.0086 |
| R | -.0026 | | -.0099 | | -.011 | | -.016 | |
| M'' | 0.14 | -0.14 | 0.62 | -0.66 | 0.07 | -0.07 | -.10 | .10 |
| -Q | | | | | | | | |
| α | | | | | | | | |
| R | | | | | | | | |
| M''' | | | | | | | | |
| M | -5.86 | -6.54 | 1.83 | 0.41 | 1.33 | 0.92 | 0.95 | 0.96 |

| 5 | | 6 | | 7 | | 8 | |
|--------|--------|--------|--------|--------|--------|--------|--------|
| E | F | F | G | G | H | H | I |
| -0.94 | -0.94 | -0.82 | -0.76 | -0.87 | -0.81 | -0.90 | -0.83 |
| -0.12 | -.0092 | -.0068 | -.0039 | -.0040 | -.0023 | -.0027 | -.0031 |
| -.026 | | -.017 | | -.011 | | -.0088 | |
| 0.86 | 0.99 | 0.72 | 0.90 | 0.80 | 0.94 | 0.92 | 0.86 |
| -0.86 | -0.72 | -0.99 | -0.80 | -0.90 | -0.92 | -0.94 | 0.00 |
| -.0080 | -.0097 | -.0079 | -.0040 | -.0040 | -.0026 | -.0024 | -.0003 |
| -.013 | | -.0090 | | -.0049 | | -.0020 | |
| .05 | - .04 | - .08 | .09 | - .05 | .04 | - .10 | .10 |
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| 0.91 | 0.95 | 0.64 | 0.99 | 0.75 | 0.98 | 0.82 | 0.96 |

First Moment Corrections - Load at C

1.
$$\begin{aligned} 299A - 37B &= 0 \\ -52A + 400B &= 5.49' \end{aligned}$$

$$\begin{aligned} A &= .0017 \\ B &= .014 \\ R_1 &= \frac{2.91 \times .0017 + 2.83 \times .014}{3.83} = .012 \end{aligned}$$

$$M_{AB} = 200(.0017 + \frac{1}{2} \times .014 - .012) = -.60$$

$$M_{BA} = 200(.014 + \frac{1}{2} \times .0017 - .012) = .60$$

2.
$$\begin{aligned} 388B - 25C &= 5.40 \\ -34B + 238C &= -2.61 \end{aligned}$$

$$\begin{aligned} B &= .013 \\ C &= -.0091 \\ R_2 &= \frac{2.96 \times .013 - 2.91 \times .0091}{3.91} = .0031 \end{aligned}$$

$$M_{BC} = 134(.013 - \frac{1}{2} \times .0091 - .0031) = .67$$

$$M_{CB} = 134(-.0091 + \frac{1}{2} \times .013 - .0031) = -.71$$

3.
$$\begin{aligned} 231C - 17D &= 4.82 \\ -23C + 134D &= -2.09 \end{aligned}$$

$$\begin{aligned} C &= .020 \\ D &= .012 \\ R_3 &= \frac{2.95 \times .02 - 2.90 \times .012}{3.90} = .0062 \end{aligned}$$

$$M_{CD} = 90(.020 - \frac{1}{2} \times .012 - .0062) = .72$$

$$M_{DC} = 90(-.012 + \frac{1}{2} \times .020 - .0062) = -.72$$

4.
$$\begin{aligned} 94D - 24E &= -2.16 \\ -24D + 135E &= -1.72 \end{aligned}$$

$$\begin{aligned} D &= -.028 \\ E &= .018 \end{aligned}$$

$$R_4 = \frac{3}{4} (-.028 - .018) = -.035$$

$$M_{DE} = 95(-.028 - \frac{1}{2} \times .018 + .035) = -.23$$

$$M_{ED} = 95(-.018 - \frac{1}{2} \times .028 + .035) = .23$$

5.

$$\begin{aligned}
 135E - 24F &= -1.71 \\
 -24E + 94F &= -1.44 \\
 E &= -.016 \\
 F &= -.019
 \end{aligned}$$

$$R_5 = \frac{3}{4} (-.016 - .019) = -.026$$

$$M_{EF} = 95(-.016 - \frac{1}{2} \times .019 + .026) = .10$$

$$M_{FE} = 95(-.016 - \frac{1}{2} \times .019 + .026) = -.10$$

6.

$$\begin{aligned}
 134F - 23G &= -1.98 \\
 -17F + 231G &= -1.60 \\
 F &= -.016 \\
 G &= -.008
 \end{aligned}$$

$$R_6 = \frac{-2.90 \times .008 - 2.95 \times .016}{3.90} = -.018$$

$$M_{FG} = 90(-.016 - \frac{1}{2} \times .008 + .018) = -.18$$

$$M_{GF} = 90(-.008 - \frac{1}{2} \times .016 + .018) = .18$$

7.

$$\begin{aligned}
 238G - 34H &= -1.80 \\
 -25G + 388H &= -1.84 \\
 G &= .0080 \\
 H &= .0052
 \end{aligned}$$

$$R_7 = \frac{-2.91 \times .0080 - 2.96 \times .0052}{3.91} = -.0098$$

$$M_{GH} = 134(-.0080 - \frac{1}{2} \times .0052 + .0098) = -.09$$

$$M_{HG} = 134(-.0080 - \frac{1}{2} \times .0052 + .0098) = .09$$

8.

$$\begin{aligned}
 400H - 52I &= -1.88 \\
 -37H + 299I &= 0 \\
 H &= -.0049 \\
 I &= -.0006
 \end{aligned}$$

$$R_8 = \frac{-2.83 \times .0049 - 2.91 \times .0006}{3.83} = -.0040$$

$$M_{HI} = 200(-.0049 - \frac{1}{2} \times .0006 + .0040) = -.20$$

$$M_{IH} = 200(-.0006 - \frac{1}{2} \times .0049 + .0040) = .20$$

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Second Moment Corrections-Load at C

1.

$$\begin{aligned} 299A - 37B &= 0 \\ -52A + 400B &= -.67 \\ A &= -.0002 \\ B &= -.0017 \end{aligned}$$

$$R_1 = \frac{-2.91 \times .0002 - 2.83 \times .0017}{3.83} = -.0014$$

$$M_{AB} = 200(-.0002 - \frac{1}{2} \times .0017 + .0014) = .08$$

$$M_{BA} = 200(-.0017 - \frac{1}{2} \times .0002 + .0014) = -.08$$

2.

$$\begin{aligned} 388B - 25C &= -.67 \\ -34B + 238C &= -.72 \\ B &= -.0020 \\ C &= -.0033 \end{aligned}$$

$$R_2 = \frac{-2.96 \times .0020 - 2.91 \times .0033}{3.91} = -.0040$$

$$M_{BC} = 134(-.0020 - \frac{1}{2} \times .0033 + .0040) = .05$$

$$M_{CB} = 134(-.0033 - \frac{1}{2} \times .0020 + .0040) = -.04$$

3.

$$\begin{aligned} 231C - 17D &= .71 \\ -23C + 134D &= .23 \\ C &= .0023 \\ D &= .0033 \end{aligned}$$

$$R_3 = \frac{2.95 \times .0023 + 2.90 \times .0033}{3.90} = .0042$$

$$M_{CD} = 90(.0023 + \frac{1}{2} \times .0033 - .0042) = -.03$$

$$M_{DC} = 90(.0033 + \frac{1}{2} \times .0023 - .0042) = .03$$

4.

$$\begin{aligned} 94D - 24E &= .72 \\ -24D + 135E &= -.10 \\ D &= .0076 \\ E &= .0006 \end{aligned}$$

$$R_4 = \frac{3}{4} (.0076 + .0006) = .0062$$

$$M_{DE} = 95(.0076 + \frac{1}{2} \times .0006 - .0062) = .16$$

$$M_{ED} = 95(.0006 + \frac{1}{2} \times .0076 - .0062) = -.16$$

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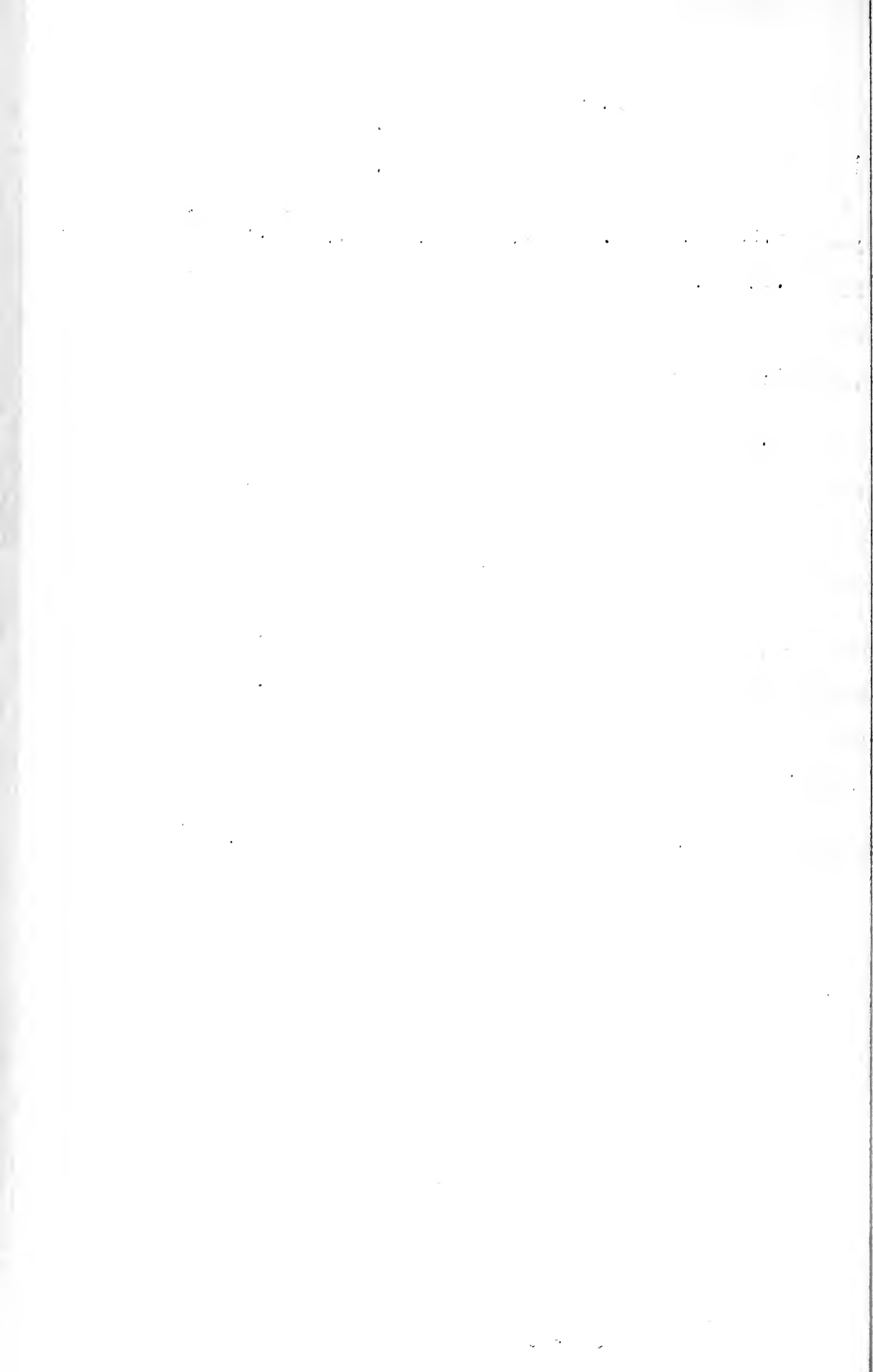
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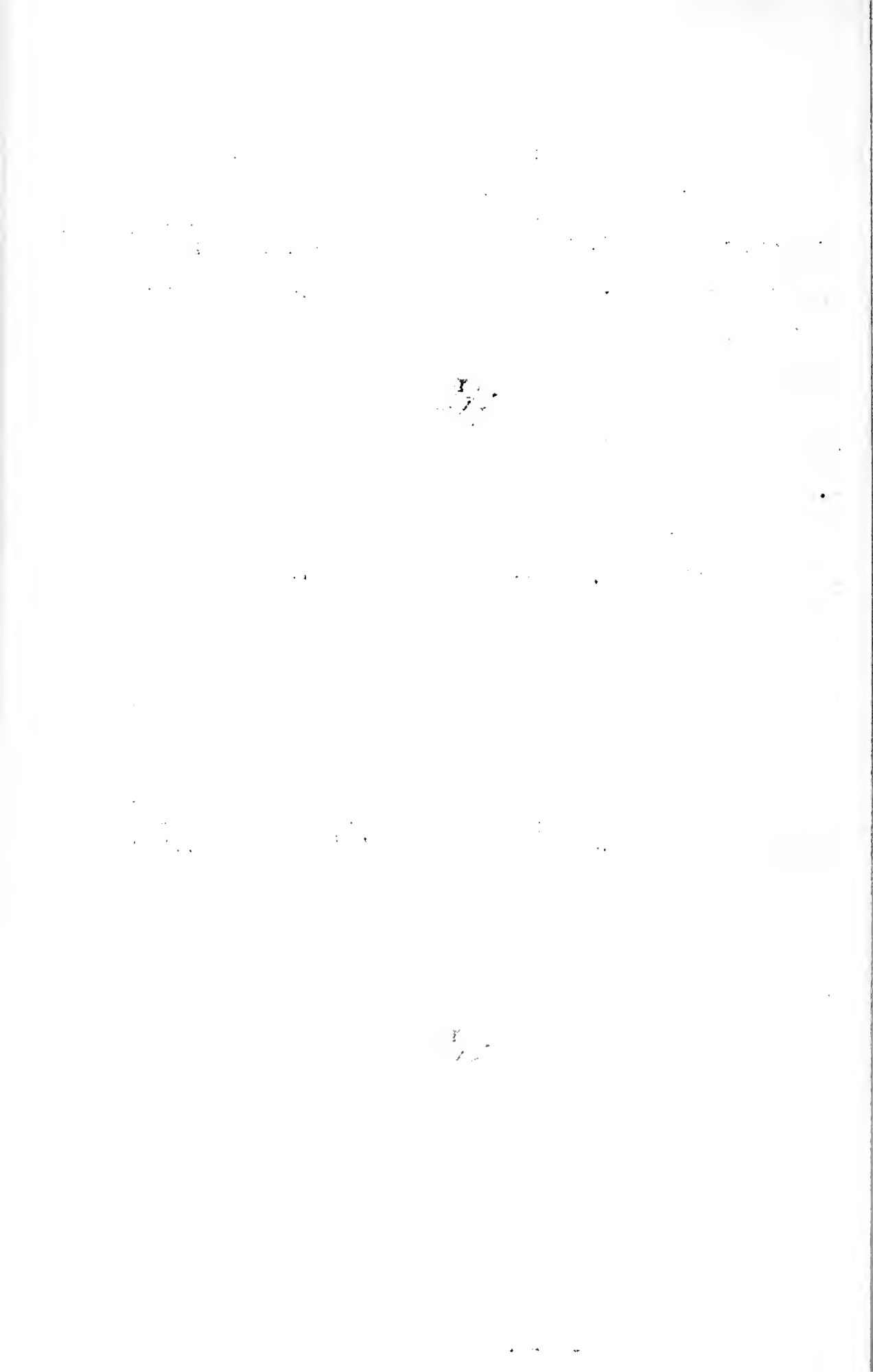
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Load at C

| Panel | 1 | | 2 | | 3 | | 4 | |
|-------|--------|--------|--------|--------|-------|-------|-------|-------|
| Joint | A | B | B | C | C | D | D | E |
| Q | 4.98 | 5.38 | 4.82 | 5.24 | -2.20 | -2.39 | -1.87 | -1.87 |
| X | .019 | .016 | .014 | .024 | -.011 | -.020 | -.018 | -.025 |
| R | .053 | | .067 | | -.050 | | -.052 | |
| M' | -5.20 | -5.40 | -5.49 | -4.82 | 2.61 | 2.16 | 2.09 | 1.71 |
| Q | 0.00 | 5.49 | 5.40 | -2.61 | 4.82 | -2.09 | -2.16 | -1.72 |
| X | .0017 | .014 | .013 | -.0091 | .020 | -0.12 | -0.28 | -.018 |
| R | .012 | | -.0031 | | .0062 | | -.035 | |
| M'' | -.60 | .60 | .67 | -.71 | .72 | -.72 | -.23 | .23 |
| Q | 0.00 | -.67 | -.67 | -.72 | .71 | .23 | .72 | -.10 |
| X | -.0002 | -.0017 | -.0020 | -.0033 | .0023 | .0033 | .0076 | .0006 |
| R | -.0014 | | -.0040 | | .0042 | | .0062 | |
| M''' | .08 | -.08 | .05 | -.04 | -.03 | .03 | .16 | -.16 |
| H | -5.72 | -4.88 | -4.77 | -5.57 | 3.29 | 1.47 | 2.02 | 1.78 |



| 5 | | 6 | | 7 | | 8 | |
|-------|-------|-------|--------|--------|--------|--------|--------|
| E | F | F | G | G | H | H | I |
| -1.88 | -1.88 | -1.64 | -1.52 | -1.74 | -1.62 | -1.80 | -1.66 |
| -.024 | -.018 | -.014 | -.0078 | -.0080 | -.0046 | -.0054 | -.0062 |
| -.052 | | -.034 | | -.022 | | -.018 | |
| 1.72 | 1.98 | 1.44 | 1.80 | 1.60 | 1.88 | 1.84 | 1.72 |
| -1.71 | -1.44 | -1.98 | -1.60 | -1.80 | -1.84 | -1.88 | 0.00 |
| -.016 | -.019 | -.016 | -.008 | -.0080 | -.0052 | -.0049 | -.0006 |
| -.026 | | -.018 | | -.0098 | | -.0042 | |
| .10 | - .10 | - .18 | .18 | - .09 | .09 | - .20 | .20 |
| 1.82 | 1.88 | 1.26 | 1.98 | 1.51 | 1.97 | 1.64 | 1.92 |



Influence Lines - First Correction

Load at D

Panel 1

$$299A - 37B = 0$$

$$-52A + 400B = 4.69$$

$$A = .001$$

$$B = .012$$

$$R_1 = .010$$

$$M_{AB} = 200(.001 + \frac{1}{2}x.012 - .01) = -.60$$

$$M_{BA} = 200(.012 + \frac{1}{2}x.001 - .01) = .60$$

Panel 2

$$389B - 25C = 4.60$$

$$-34B + 238C = 4.50$$

$$B = .013$$

$$C = .021$$

$$R_2 = .025$$

$$M_{BC} = 134(.013 + \frac{1}{2}x.021 - .025) = -.27$$

$$M_{CB} = 134(.021 + \frac{1}{2}x.013 - .025) = .27$$

Panel 3

$$231C - 17D = 4.15$$

$$-23C + 134D = -3.14$$

$$C = .016$$

$$D = -.021$$

$$R_3 = -.003$$

$$M_{CD} = 90(.016 - \frac{1}{2}x.021 + .003) = .81$$

$$M_{DC} = 90(-.021 + \frac{1}{2}x.016 + .003) = -.90$$

Panel 4

$$135D - 24E = 3.78$$

$$-24D + 94E = -2.58$$

$$D = .024$$

$$E = -.021$$

$$R_4 = .002$$

$$M_{DL} = 95(.024 - \frac{1}{2}x.021 - .002) = 1.14$$

$$M_{ED} = 95(-.021 + \frac{1}{2}x.024 - .002) = -1.04$$

1. The first part of the paper is devoted to a general discussion of the problem.

2. The second part is devoted to a detailed analysis of the case.

3. The third part is devoted to a detailed analysis of the case.

4. The fourth part is devoted to a detailed analysis of the case.

5. The fifth part is devoted to a detailed analysis of the case.

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7. The sixth part is devoted to a detailed analysis of the case.

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9. The seventh part is devoted to a detailed analysis of the case.

10.

11.

12. The eighth part is devoted to a detailed analysis of the case.

13. The ninth part is devoted to a detailed analysis of the case.

14. The tenth part is devoted to a detailed analysis of the case.

Panel 5

$$-24F + 94E = -2.56$$

$$135F - 24E = -2.16$$

$$E = -.033$$

$$F = -.022$$

$$R_5 = -.041$$

$$M_{FF} = 95(-.033 - \frac{1}{2}x.022 + .041) = -.28$$

$$M_{FE} = 95(-.022 - \frac{1}{2}x.033 + .041) = .28$$

Panel 6

$$-23G + 134F = -2.97$$

$$231G - 17F = -2.40$$

$$F = -.024$$

$$G = -.012$$

$$R_6 = -.027$$

$$M_{FG} = 90(-.024 - \frac{1}{2}x.012 + .027) = -.27$$

$$M_{GF} = 90(-.012 - \frac{1}{2}x.024 + .027) = .27$$

Panel 7

$$-34H + 238G = -2.70$$

$$389H - 25G = -2.76$$

$$G = -.012$$

$$H = -.008$$

$$R_7 = -.015$$

$$M_{GH} = 134(-.012 - \frac{1}{2}x.008 + .015) = -.13$$

$$M_{HG} = 134(-.008 - \frac{1}{2}x.012 + .015) = .13$$

Panel 8

$$-52I + 400H = -2.82$$

$$299I - 37H = 0$$

$$H = -.001$$

$$I = -.007$$

$$R_8 = -.005$$

$$M_{HI} = 200(0 - \frac{1}{2}x.007 + .005) = .40$$

$$M_{IH} = 200(-.007 - \frac{1}{2}x0 + .005) = -.40$$

Influence Lines - Second Correction - Load at D

Panel 1

$$299A - 37B = 0$$

$$-53A + 400B = .27$$

$$A = 0$$

$$B = .0007$$

$$R_1 = 0$$

$$M_{AB} = 0$$

$$M_{BA} = 0$$

Panel 2

$$389B - 25C = -.60$$

$$-34B + 238C = -.81$$

$$B = -.0018$$

$$C = -.0037$$

$$R_2 = -.0041$$

$$M_{BC} = 134(-.0018 - \frac{1}{2}x.0037 + .0041) = .07$$

$$M_{CB} = 134(-.0037 - \frac{1}{2}x.0018 + .0041) = -.07$$

Panel 3

$$231C - 17D = -.27$$

$$-.23C + 134D = -1.14$$

$$C = -.0019$$

$$D = -.0088$$

$$R_3 = -.0080$$

$$M_{CD} = 90(-.0019 - \frac{1}{2}x.0088 + .0080) = .15$$

$$M_{DC} = 90(-.0088 - \frac{1}{2}x.0019 + .0080) = -.15$$

Panel 4

$$135D - 24E = .90$$

$$-24D + 94E = .28$$

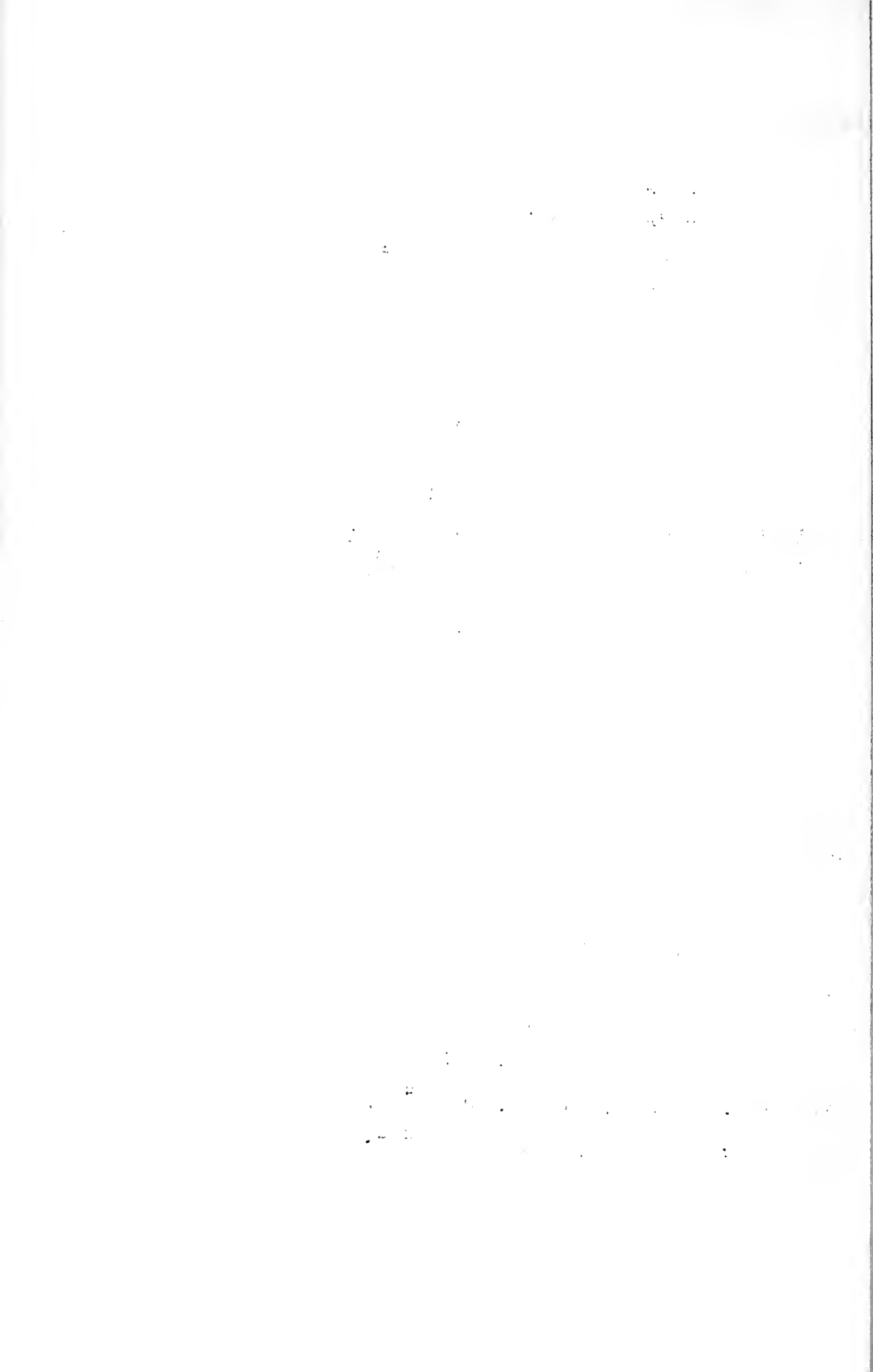
$$D = .0076$$

$$E = .0049$$

$$R_4 = .0094$$

$$M_{DE} = 95(.0076 + \frac{1}{2}x.0049 - .0094) = .07$$

$$M_{ED} = 95(.0049 + \frac{1}{2}x.0076 - .0094) = -.07$$



Panel 5

$$-24F + 94E = 1.04$$

$$135F - 24E = .27$$

$$E = .0121$$

$$F = .0042$$

$$R_5 = .0122$$

$$M_{EF} = 95(.0121 + \frac{1}{2}x.0042 - .0122) = .19$$

$$M_{FE} = 95(.0042 + \frac{1}{2}x.0121 - .0122) = -.19$$

Panel 6

$$-23G + 134F = -.28$$

$$231G - 17F = .13$$

$$F = -.0020$$

$$G = .0004$$

$$R_6 = -.0012$$

$$M_{FG} = 90(-.0020 + \frac{1}{2}x.0004 + .0012) = -.05$$

$$M_{GF} = 90(.0004 - \frac{1}{2}x.0020 + .0012) = .05$$

Panel 7

$$-34H + 238G = -.27$$

$$389H - 25G = -.40$$

$$G = -.0013$$

$$H = -.0011$$

$$R_7 = -.0018$$

$$M_{GH} = 134(-.0013 - \frac{1}{2}x.0011 + .0018) = 0$$

$$M_{HG} = 134(-.0011 - \frac{1}{2}x.0013 + .0018) = 0$$

Panel 8

$$-52I + 400H = -.13$$

$$299I - 37H = 0$$

$$H = -.0003$$

$$R_8 = 0$$

$$M_{IH} = 0$$

$$I = 0$$

$$M_{HI} = 0$$

Load at PP3

| Panel | 1 | | 2 | | 3 | | 4 | |
|----------|-------|-------|--------|--------|--------|--------|-------|-------|
| Joint | A | B | B | C | C | D | D | E |
| -Q | 4.15 | 4.49 | 4.02 | 4.36 | 3.80 | 4.12 | -2.88 | -2.81 |
| α | .016 | .013 | .012 | .020 | .019 | .034 | -.027 | -.037 |
| R | .044 | | .057 | | .086 | | -.078 | |
| M' | -4.40 | -4.60 | -4.69 | -4.15 | -4.50 | -3.78 | 3.14 | 2.56 |
| -Q | 0 | 4.69 | 4.60 | 4.50 | 4.15 | -3.14 | 3.78 | -2.58 |
| α | .001 | .012 | .031 | .021 | .016 | -.021 | .024 | -.021 |
| R | .010 | | .025 | | -.003 | | .002 | |
| M'' | -.60 | .60 | -.27 | .27 | .81 | -.90 | 1.14 | -1.04 |
| -Q | 0 | .27 | -.60 | -.81 | -.27 | -1.14 | .90 | .28 |
| α | 0 | .0007 | -.0018 | -.0037 | -.0019 | -.0083 | .0076 | .0049 |
| R | 0 | | -.0041 | | -.0080 | | .0094 | |
| M''' | 0 | 0 | .07 | -.07 | .15 | -.15 | .07 | -.07 |
| M | -5.00 | -4.00 | -4.89 | -3.95 | -3.54 | -4.83 | 4.35 | 1.45 |

| 5 | | 6 | | 7 | | 8 | |
|-------|-------|--------|-------|--------|--------|--------|-------|
| E | F | F | G | G | H | H | I |
| -2.82 | -2.82 | -2.46 | -2.28 | -2.61 | -2.43 | -2.70 | -2.49 |
| -.036 | -.028 | -.020 | -.012 | -.012 | -.007 | -.008 | -.009 |
| -.078 | | -.051 | | -.033 | | -.026 | |
| 2.58 | 2.97 | 2.16 | 2.70 | 2.40 | 2.82 | 2.76 | 2.58 |
| -2.56 | -2.16 | -2.97 | -2.40 | -2.70 | -2.76 | -2.82 | 0 |
| -.035 | -.022 | -.024 | -.012 | -.012 | -.008 | -.001 | -.007 |
| -.041 | | -.027 | | -.015 | | -.005 | |
| -.26 | .23 | -.27 | .27 | -.13 | .13 | .40 | -.40 |
| 1.04 | .27 | -.28 | .13 | -.27 | -.40 | -.13 | 0 |
| .0121 | .0042 | -.0020 | .0004 | -.0013 | -.0011 | -.0003 | 0 |
| .0122 | | -.0012 | | -.0018 | | 0 | |
| .19 | -.19 | -.05 | .05 | 0 | 0 | 0 | 0 |
| 2.49 | 3.06 | 1.84 | 3.02 | 2.27 | 2.95 | 3.16 | 2.18 |

Influence Lines First Correction Load at E

Panel 1, 8

$$299A - 37B = 0$$

$$-52A + 100B = 3.76$$

$$A = .0012$$

$$B = .0095$$

$$R_1 = .0079$$

$$M_{AB} = 200(.0012 + \frac{1}{2} \times .0095 - .0079) = -.40$$

$$M_{BA} = 200(.0095 + \frac{1}{2} \times .0012 - .0079) = .40$$

Panel 2, 7

$$389B - 25C = -.21$$

$$-34B + 238C = 3.60$$

$$B = .0105$$

$$C = .0172$$

$$R_2 = .208$$

$$M_{EC} = 134(.0105 + \frac{1}{2} \times .0172 - .0208) = -.21$$

$$M_{CE} = 134(.0172 + \frac{1}{2} \times .0105 - .0208) = .21$$

Panel 3, 6

$$231C - 17D = 3.20$$

$$-23C + 134D = 3.96$$

$$C = .0162$$

$$D = .0324$$

$$R_3 = .0364$$

$$M_{CD} = 90(.0162 + \frac{1}{2} \times .0324 - .0362) = -.36$$

$$M_{DC} = 90(.0324 + \frac{1}{2} \times .0162 - .0362) = .36$$

Panel 4, 5

$$135D - 24E = 2.88$$

$$-24D + 94E = -3.44$$

$$D = .0155$$

$$E = -.0326$$

$$R_4 = -.0128$$

$$M_{DE} = 95(.0155 - \frac{1}{2} \times .0326 + .0128) = 1.14$$

$$M_{ED} = 95(-.0326 - \frac{1}{2} \times .0155 + .0128) = -1.14$$

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Influence Lines - Second Correction - Load at E

Panel 1,8

$$\begin{aligned} 299A - 37B &= 0 \\ -52A + 400B &= .21 \\ A &= .00007 \\ B &= .00053 \\ R_1 &= .00044 \end{aligned}$$

$$M_{AB} = 200(.00007 + \frac{1}{2}x.00053 - .00044) = -.02$$

$$M_{BA} = 200(.00053 + \frac{1}{2}x.00007 - .00044) = .02$$

Panel 2,7

$$\begin{aligned} 389B - 25C &= -.40 \\ -34B + 238C &= .36 \\ B &= -.00094 \\ C &= .00132 \\ R_2 &= .00027 \end{aligned}$$

$$M_{BC} = 134(-.00094 + \frac{1}{2}x.00132 - .00027) = -.08$$

$$M_{CB} = 134(.00132 - \frac{1}{2}x.00094 - .00027) = .08$$

Panel 3,6

$$\begin{aligned} 231C - 17D &= -.21 \\ -23C + 134D &= -1.14 \\ C &= -.0016 \\ D &= -.0088 \\ R_3 &= -.0077 \end{aligned}$$

$$M_{CD} = 90(-.0016 - \frac{1}{2}x.0088 + .0077) = .16$$

$$M_{DC} = 90(-.0088 - \frac{1}{2}x.0016 + .0077) = -.16$$

Panel 4,5

$$\begin{aligned} 135D - 24E &= -.21 \\ -24D + 94E &= 0 \\ D &= -.0016 \\ E &= -.0004 \\ R_4 &= -.0015 \end{aligned}$$

$$M_{DE} = 95(-.0016 - \frac{1}{2}x.0004 + .0015) = -.03$$

$$M_{ED} = 95(-.0004 - \frac{1}{2}x.0016 + .0015) = .03$$

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Load at PP-4

| Panel | 1 | | 2 | | 3 | | 4 | |
|----------|--------|--------|--------|--------|--------|--------|--------|--------|
| Joint | A | B | B | C | C | D | D | E |
| -Q | 3.32 | 3.59 | 3.22 | 3.49 | 3.04 | 3.30 | 3.75 | 3.75 |
| α | .012 | .011 | .009 | .016 | .015 | .017 | .036 | .049 |
| R | .035 | | .045 | | .069 | | .10 | |
| M' | -3.44 | -3.68 | -3.76 | -3.20 | -3.60 | -2.88 | -3.96 | -3.44 |
| -Q | 0 | 3.76 | 3.68 | 3.60 | 3.20 | 3.96 | 2.88 | -3.44 |
| α | .0012 | .0095 | .0105 | .0172 | .0162 | .0324 | .0155 | -.0326 |
| R | .0079 | | .0208 | | .0364 | | -.0128 | |
| M'' | -.40 | .40 | -.21 | .21 | -.36 | .36 | 1.14 | -1.14 |
| -Q | 0 | .21 | -.40 | .36 | -.21 | -1.14 | -.36 | -1.14 |
| α | .00007 | .00053 | .00049 | .00132 | -.0016 | -.0088 | -.0016 | -.0004 |
| R | .00044 | | .00027 | | -.0077 | | -.0015 | |
| M''' | -.02 | .02 | -.08 | .08 | .16 | -.16 | -.03 | .03 |
| M | -3.86 | -3.26 | -4.05 | -2.91 | -3.80 | -2.68 | -2.85 | -4.55 |

| 5 | | 6 | | 7 | | 8 | |
|-------|--------|--------|--------|--------|--------|--------|--------|
| F | F | F | G | G | H | H | I |
| -5.73 | -3.78 | -3.28 | -3.04 | -3.48 | -3.24 | -3.60 | -3.32 |
| .049 | -.036 | -.027 | -.015 | -.016 | -.009 | -.011 | -.012 |
| .10 | | -.069 | | -.045 | | -.035 | |
| 3.44 | 3.96 | 2.88 | 3.60 | 3.20 | 3.76 | 3.68 | 3.44 |
| 3.44 | -2.88 | -3.96 | -3.20 | -3.60 | -3.68 | -3.76 | 0 |
| .0326 | -.0155 | -.0324 | -.0162 | -.0172 | -.0105 | -.0095 | -.0012 |
| .0128 | | -.0364 | | -.0208 | | -.0079 | |
| 1.14 | -1.14 | -.36 | .36 | -.21 | .21 | -.40 | .40 |
| 1.14 | .36 | 1.14 | .21 | -.36 | .40 | -.21 | 0 |
| .0004 | .0016 | .0088 | .0016 | .00132 | .00094 | .00053 | .00007 |
| .0015 | | .0077 | | .00027 | | .00044 | |
| -.03 | .03 | .16 | -.16 | -.08 | .08 | -.02 | .02 |
| 4.55 | 2.85 | 2.68 | 3.80 | 2.91 | 4.05 | 3.26 | 3.86 |

Moment Computations - Web Members

Member AA'

$$Dh = 3140 \text{ fk}$$

$$hh \text{ E-60} = 2755$$

$$\text{Impact} = \underline{590}$$

$$\text{Total} = 6485$$

$$hh \text{ H-15-S12-44} = 367$$

$$\text{Conc.} = 86$$

$$\text{Impact} = \underline{62}$$

$$\text{Total} = 515$$

$$\text{Sidewalk} = 222$$

$$\text{Design Moment} = 11,762 \text{ fk}$$

Member BB'

$$Dh = 5180 \text{ fk}$$

$$hh \text{ E-60} = 4423$$

$$\text{Impact} = \underline{947}$$

$$\text{Total} = 10,550$$

$$hh \text{ H15-S12-44} = 606$$

$$\text{Conc.} = 142$$

$$\text{Impact} = \underline{102}$$

$$\text{Total} = 850$$

$$\text{Sidewalk} = 362$$

$$\text{Design Moment} = 11,762 \text{ fk}$$

Member CC'

$$Dh = 3258 \text{ fk}$$

$$hh \text{ E-60} = 2882$$

$$\text{Impact} = \underline{626}$$

$$\text{Total} = 6766$$

$$hh \text{ H15-S12-44} = 381$$

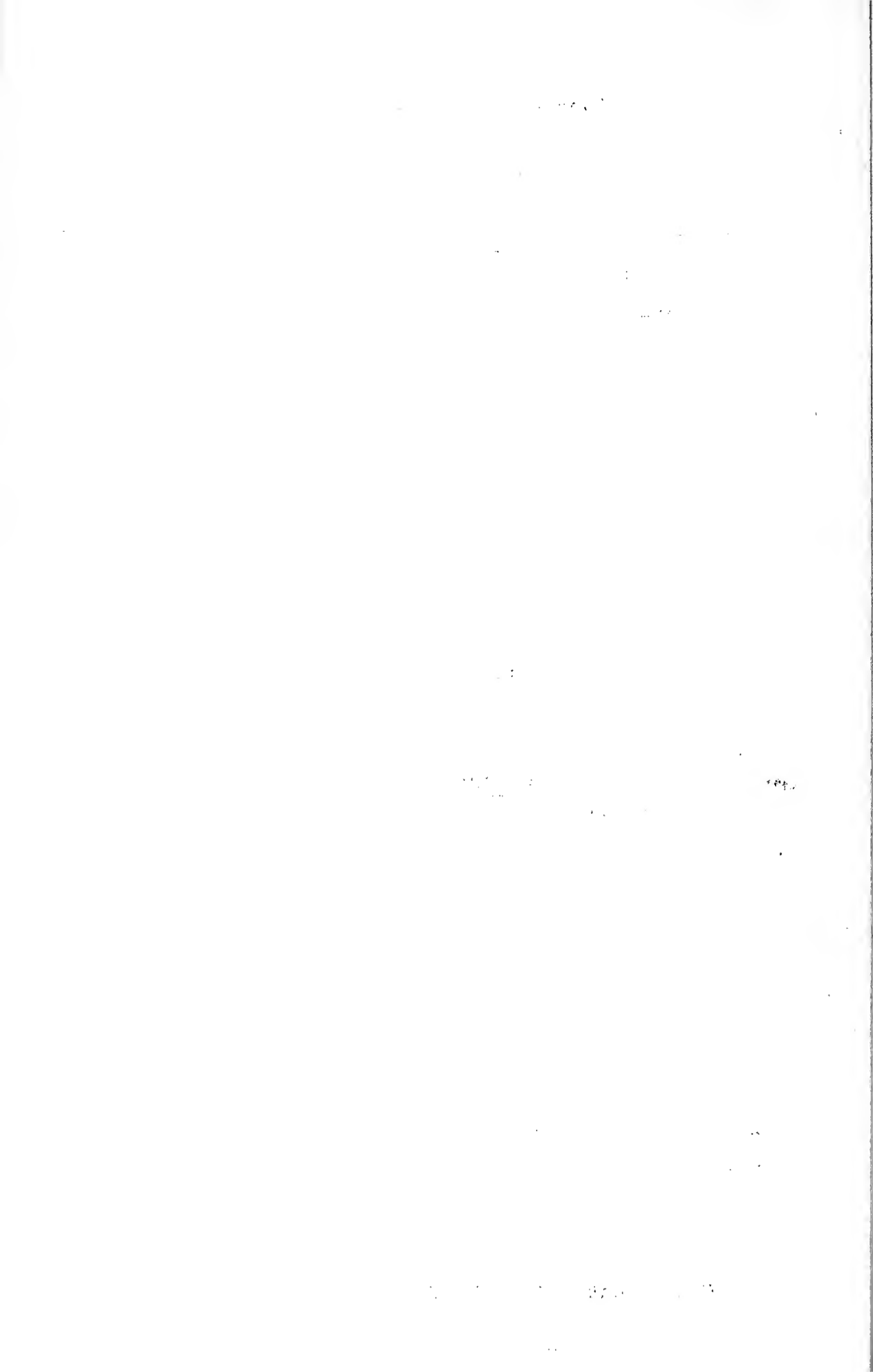
$$\text{Conc.} = 109$$

$$\text{Impact} = \underline{77}$$

$$\text{Total} = 567$$

$$\text{Sidewalk} = 242$$

$$\text{Design Moment} = 7,575 \text{ fk}$$



Member DE

| | | |
|---------------|---|------------|
| Dh | = | 1830 |
| hh-E-60 | = | 1652 |
| Impact | = | <u>466</u> |
| Total | | 3948 |
| hr H15-S12-44 | = | 215 |
| Conc. | = | 79 |
| Impact | = | <u>53</u> |
| Total | | 347 |
| Sidewalk | = | 152 |
| Design Moment | = | 4,447 |

Member EE'

| | | |
|---------------|---|------------|
| Dh | = | 1156 fk |
| hh-E-60 | = | 1110 |
| Impact | = | <u>389</u> |
| Total | | 2655 |
| hh h15-S12-44 | = | 135 |
| Conc. | = | 64 |
| Impact | = | <u>42</u> |
| Total | | 241 |
| Sidewalk | = | 104 |
| Design Moment | = | 3000 fk |

Moment Computations - Chord Members

Member AB

| | | | |
|---------------|---|------------|----|
| DL | = | 3140 | fk |
| LL-E60 | = | 2755 | |
| Impact | = | <u>590</u> | |
| Total | | 6485 | |
| LL HL5-S12-44 | = | 367 | |
| Conc. | = | 86 | |
| Impact | = | <u>62</u> | |
| Total | | 515 | |
| Sidewalk | = | 222 | |
| Design Moment | = | 7,222 | |

Member BC

| | | | |
|---------------|---|------------|----|
| DL | = | 2330 | fk |
| LL-E60 | = | 2128 | |
| Impact | = | <u>454</u> | |
| Total | | 4912 | |
| LL HL5-S12-44 | = | 273 | |
| Conc. | = | 80 | |
| Impact | = | <u>55</u> | |
| Total | | 408 | |
| Sidewalk | = | 172 | |
| Design Moment | = | 5,492 | fk |

Member CD

| | | | |
|---------------|---|------------|----|
| DL | = | 1525 | fk |
| LL-E60 | = | 1382 | |
| Impact | = | <u>321</u> | |
| Total | = | 3128 | |
| LL H15-S12-44 | = | 179 | |
| Conc. | = | 61 | |
| Impact | = | <u>41</u> | |
| Total | = | 281 | |
| Sidewalk | = | 120 | |
| Design Moment | = | 3,529 | fk |

Member DE

| | | | |
|---------------|---|------------|----|
| DL | = | 1135 | fk |
| LL-E60 | = | 1088 | |
| Impact | = | <u>327</u> | |
| Total | = | 2550 | |
| LL H15-S12-44 | = | 133 | |
| Conc. | = | 62 | |
| Impact | = | <u>37</u> | |
| Total | = | 232 | |
| Sidewalk | = | 95 | |
| Design Moment | = | 2,877 | fk |

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Influence Line Computations.

Load at B

Panel #1

$$-Q_A = \frac{(.0942 - 1)(.0866 \times 26.25 - .875 \times 30)}{2(2 - .0866)1} = 5.77$$

$$-Q_B = \frac{(.875 \times 30 - .0866 \times 26.25)}{2(2 - .0866)} = 6.28$$

$$Q_{R1} = \frac{.875 \times 30 - .0866 \times 26.25}{2(2 - .0866)1} = 6.28$$

Panel #2

$$-Q_B = \frac{(.0463 - 1)(.0443 \times 22.5 + .125 \times 30)}{2(2 - .0443)} = -1.15$$

$$-Q_C = \frac{(-.125 \times 30 - .0443 \times 22.5)}{2(2 - .0443)} = -1.21$$

$$Q_{R2} = \frac{-.125 \times 30 - .0443 \times 22.5}{2(2 - .0443)1} = -1.21$$

Panel #3

$$-Q_C = \frac{(.0507 - 1)(.0482 \times 18.75 + .125 \times 30)}{2(2 - .0482)1} = -1.13$$

$$-Q_D = \frac{-.125 \times 30 - .0482 \times 18.75}{2(2 - .0482)} = -1.19$$

$$Q_{R3} = \frac{-.125 \times 30 - .0482 \times 18.75}{2(2 - .0482)1} = -1.19$$

Panel #4

$$-Q_D = \frac{-1(.125 \times 30)}{4} = -.94$$

$$-Q_E = \frac{-.125 \times 30}{4} = -.94$$

$$Q_{R4} = \frac{-.125 \times 30}{4} = -.94$$

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Panel 5

$$-Q_E = \frac{-.125 \times 30}{4} = -0.94$$

$$-Q_F = \frac{-.125 \times 30}{4} = -0.94$$

$$Q_{R5} = \frac{-.125 \times 30}{4 \times 1} = -0.94$$

Panel 6

$$-Q_G = \frac{(.0507 \times 1 - 1)(-.0482 \times 11.25 + .125 \times 30)}{2(2 - .0482)1} = -0.78$$

$$-Q_F = \frac{(-.125 \times 30 + .0482 \times 11.25)}{2(2 - .0482)} = -0.82$$

$$Q_{R6} = \frac{(-.125 \times 30 + .0482 \times 11.25)}{2(2 - .0482)1} = -0.82$$

Panel 7

$$-Q_H = \frac{(.0463 \times 1 - 1)(-.0443 \times 7.5 + .125 \times 30)}{2(2 - .0443)1} = -0.83$$

$$-Q_G = \frac{(-.125 \times 30 + .0443 \times 7.5)}{2(2 - .0443)} = -0.87$$

$$Q_{R7} = \frac{(-.125 \times 30 + .0443 \times 7.5)}{2(2 - .0443)1} = -0.87$$

Panel 8

$$-Q_I = \frac{(.0942 \times 1 - 1)(-.0866 \times 3.75 + .125 \times 30)}{2(2 - .0866)1} = -0.81$$

$$-Q_H = \frac{(-.125 \times 30 + .0866 \times 3.75)}{2(2 - .0866)} = -0.90$$

$$Q_{R8} = \frac{(-.125 \times 30 + .0866 \times 3.75)}{2(2 - .0866)} = -0.90$$

Load at C

Panel 1

$$-Q_A = \frac{(.0942 - 1)(.0866 \times 22.5 - .75 \times 30)}{2(2 - .0866)1} = 4.89$$

$$-Q_B = \frac{(.75 \times 30 - .0866 \times 22.5)}{2(2 - .0866)} = 5.38$$

$$Q_{R1} = \frac{.75 \times 30 - .0866 \times 22.5}{2(2 - .0866)1} = 5.38$$

Panel 2

$$-Q_B = \frac{(.0463 - 1)(.0443 \times 45 - .75 \times 30)}{2(2 - .0443)1} = 4.96$$

$$-Q_C = \frac{(.75 \times 30 - .0443 \times 45)}{2(2 - .0443)} = 5.23$$

$$Q_{R2} = \frac{.75 \times 30 - .0443 \times 45}{2(2 - .0443)1} = 5.23$$

Panel 3

$$-Q_C = \frac{(.0507 - 1)(.0482 \times 37.5 + .25 \times 30)}{2(2 - .0482)1} = -2.36$$

$$-Q_D = \frac{(-.25 \times 30 - .0482 \times 37.5)}{2(2 - .0482)} = -2.38$$

$$Q_{R3} = \frac{-.25 \times 30 - .0482 \times 37.5}{2(2 - .0482)1} = -2.38$$

Panel 4

$$-Q_D = \frac{-1(.25 \times 30)}{4} = -1.87$$

$$-Q_E = \frac{-.25 \times 30}{4} = -1.87$$

$$Q_{R4} = \frac{-.25 \times 30}{4} = -1.87$$

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Panel 5

$$-Q_E = -1.88$$

$$-Q_F = -1.88$$

$$Q_{R5} = -1.88$$

Panel 6

$$-Q_H = -1.64$$

$$-Q_G = -1.56$$

$$Q_{R6} = -1.64$$

Panel 7

$$-Q_G = -1.74$$

$$-Q_H = -1.66$$

$$Q_{R7} = -1.74$$

Panel 8

$$-Q_H = -1.80$$

$$-Q_I = -1.62$$

$$Q_{R8} = -1.80$$

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Load at D

Panel 1

$$-Q_A = \frac{(.0942 - 1)(.0866 \times 18.75 - .625 \times 30)}{2(2 - .0866)1} = 4.12$$

$$-Q_B = \frac{.625 \times 30 - .0866 \times 18.75}{2(2 - .0866)} = 4.49$$

$$Q_{R1} = \frac{.625 \times 30 - .0866 \times 18.75}{2(2 - .0866)1} = 4.49$$

Panel 2

$$-Q_B = \frac{(.0463 - 1)(.0443 \times 37.5 - .625 \times 30)}{2(2 - .0443)1} = 4.14$$

$$-Q_C = \frac{(.625 \times 30 - .0443 \times 37.5)}{2(2 - .0443)} = 4.36$$

$$Q_{R2} = \frac{.625 \times 30 - .0443 \times 37.5}{2(2 - .0443)1} = 4.36$$

Panel 3

$$-Q_C = \frac{(.0507 - 1)(.0482 \times 56.25 - .625 \times 30)}{2(2 - .0482)1} = 3.91$$

$$-Q_D = \frac{.625 \times 30 - .0482 \times 56.25}{2(2 - .0482)} = 4.12$$

$$Q_{R3} = \frac{.625 \times 30 - .0482 \times 56.25}{2(2 - .0482)} = 4.12$$

Panel 4

$$-Q_D = \frac{-1(.375 \times 30)}{4} = -2.82$$

$$-Q_E = \frac{(-.375 \times 30)}{4} = -2.82$$

$$Q_{R4} = \frac{-.375 \times 30}{4} = -2.82$$

Panel 5

$$-Q_E = -2.82$$

$$-Q_F = -2.82$$

$$Q_{R5} = -2.82$$

Panel 6

$$-Q_F = -2.46$$

$$-Q_G = -2.34$$

$$Q_{R6} = -2.46$$

Panel 7

$$-Q_G = -2.61$$

$$-Q_H = -2.49$$

$$Q_{R7} = -2.61$$

Panel 8

$$-Q_H = -2.70$$

$$-Q_I = -2.43$$

$$Q_{R8} = -2.70$$

Load at E

Panel 1

$$-Q_A = \frac{(.0942 - 1)(.0866 \times 15 - .5 \times 30)}{2(2 - .0866)1} = 3.26$$

$$-Q_B = \frac{.5 \times 30 - .0866 \times 15}{2(2 - .0866)} = 3.59$$

$$Q_{R1} = \frac{.5 \times 30 - .0866 \times 15}{2(2 - .0866)1} = 3.59$$

Panel 2

$$-Q_B = \frac{(.0463 - 1)(.0443 \times 30 - .5 \times 30)}{2(2 - .0443)1} = 3.31$$

$$-Q_C = \frac{(.5 \times 30 - .0443 \times 30)}{2(2 - .0443)} = 3.49$$

$$Q_{R2} = \frac{.5 \times 30 - .0443 \times 30}{2(2 - .0443)1} = 3.49$$

Panel 3

$$-Q_C = \frac{(.0507 - 1)(.0482 \times 45 - .5 \times 30)}{2(2 - .0482)1} = 3.13$$

$$-Q_D = \frac{(.5 \times 30 - .0482 \times 45)}{2(2 - .0482)} = 3.30$$

$$Q_{R3} = \frac{.5 \times 30 - .0482 \times 45}{2(2 - .0482)1} = 3.30$$

Panel 4

$$-Q_D = \frac{-1(-.5 \times 30)}{4} = 3.75$$

$$-Q_E = \frac{(.5 \times 30)}{4} = 3.75$$

$$Q_{R4} = \frac{.5 \times 30}{4} = 3.75$$

Panel 5

$$-Q_E = -3.76$$

$$-Q_F = -3.76$$

$$Q_{R5} = -3.76$$

Panel 6

$$-Q_E = -3.28$$

$$-Q_G = -3.12$$

$$Q_{R6} = -3.28$$

Panel 7

$$-Q_G = -3.48$$

$$-Q_H = -3.32$$

$$Q_{R7} = -3.48$$

Panel 8

$$-Q_H = -3.60$$

$$-Q_I = -3.24$$

$$Q_{R8} = -3.60$$

Equations for Determining Joint Constants

Panel 1

$$\left[1.5x1 + 1 + \frac{(3 - .0866)(.0942x1 - 1)}{2(2 - .0866)} \right] A + \left[\frac{1}{2} + \frac{(3 - 2x.0866)(.0942x1 - 1)}{2(2 - .0866)} \right] B = -Q_A$$

$$1.82A - .17B = -Q_A$$

$$\left[1 + 1.5x1 - \frac{(3 - 2x.0866)1}{2(2 - .0866)} \right] B + \left[\frac{1}{2} - \frac{(3 - .0866)1}{2(2 - .0866)} \right] A = -Q_B$$

$$1.76B - .26A = -Q_B$$

Panel 2

$$\left[1.5x1 + 1 + \frac{(3 - .0443)(.0463x1 - 1)}{2(2 - .0443)} \right] B + \left[\frac{1}{2} + \frac{(3 - 2x.0443)(.0463x1 - 1)}{2(2 - .0443)} \right] C = -Q_B$$

$$1.78B - .21C = -Q_B$$

$$\left[1 + 1.5x1 - \frac{(3 - 2x.0443)1}{2(2 - .0443)} \right] C + \left[\frac{1}{2} + \frac{(3 - .0443)1}{2(2 - .0443)} \right] B = -Q_C$$

$$1.76C - .26B = -Q_C$$

Panel 3

$$\left[1.5x1 + 1 + \frac{(3 - .0482)(.0507x1 - 1)}{2(2 - .0482)} \right] C$$

$$+ \left[\frac{1}{2} + \frac{(3 - 2x.0482)(.0507x1 - 1)}{2(2 - .0482)} \right] D = -Q_C$$

$$1.78C - .21D = -Q_C$$

$$\left[1 + 1.5x1 - \frac{(3 - 2x.0482)x1}{2(2 - .0482)} \right] D$$

$$+ \left[\frac{1}{2} - \frac{(3 - .0482)x1}{2(2 - .0482)} \right] C = -Q_D$$

$$1.76D - .26C = -Q_D$$

Panel 4

$$\left[1.5x1 + \frac{1}{4} \right] D - \frac{1}{4}E = -Q_D$$

$$1.75D - .25E = -Q_D$$

$$\left[1.5x1 + \frac{1}{4} \right] E - \frac{1}{4}D = -Q_E$$

$$1.75E - .25D = -Q_E$$

Joint Constant Computation - Load at B

Panel 1

$$1.82A - .17B = 5.77$$

$$-.26A + 1.76B = 6.28$$

$$A = 3.56 \quad B = 4.09$$

$$R_1 = \frac{2.91 \times 3.56 + 2.83 \times 4.09}{3.82} + 6.28 = 12.03$$

$$M_{FL} = (3.56 + \frac{4.09}{2} - 12.03) = -6.43$$

$$M_{BA} = (4.09 + \frac{3.56}{2} - 12.03) = -6.16$$

Panel 2

$$1.78B - .21C = -1.15$$

$$-.26B + 1.76C = -1.21$$

$$B = -.74 \quad C = -.80$$

$$R_2 = \frac{-2.96 \times .74 - 2.91 \times .80}{3.92} - 1.21 = -2.36$$

$$M_{BC} = (-.74 - \frac{.80}{2} + 2.36) = 1.22$$

$$M_{CB} = (-.80 - \frac{.74}{2} + 2.36) = 1.19$$

Panel 3

$$1.78C - .21D = -1.13$$

$$-.26C + 1.76D = -1.19$$

$$C = -.73 \quad D = -.78$$

$$R_3 = \frac{-2.95 \times .73 - 2.90 \times .78}{3.90} - 1.19 = -2.33$$

$$M_{CD} = (-.73 - \frac{.78}{2} + 2.33) = 1.21$$

$$M_{DC} = (-.78 - \frac{.73}{2} + 2.33) = 1.19$$

Panel 4

$$1.75D - .25E = -.94$$

$$-.25D + 1.75E = -.94$$

$$D = -.63 \quad E = -.63$$

$$R_4 = \frac{3}{2}(-.63 - .63) - .94 = -1.88$$

$$M_{DE} = (-.63 - \frac{.63}{2} + 1.88) = .94$$

$$M_{ED} = (-.63 - \frac{.63}{2} + 1.88) = .94$$

The first of these is the fact that the

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the thirteenth is the fact that the

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the fifteenth is the fact that the

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the seventeenth is the fact that the

the eighteenth is the fact that the

Panel 5

$$1.75E - .25F = -0.94$$

$$-.25E + 1.75F = -0.94$$

$$E = -0.63 \quad F = -0.63$$

$$R_5 = 3/4(-0.63 - 0.63) - 0.94 = -1.88$$

$$M_{EF} = 1(-0.63 - \frac{1}{2} \times 0.63 + 1.88) = .94$$

$$M_{FE} = 1(-0.63 - \frac{1}{2} \times 0.63 + 1.88) = .94$$

Panel 6

$$1.76F - .26G = -0.82$$

$$-.21F + 1.78G = -0.78$$

$$F = -0.54 \quad G = -0.50$$

$$R_6 = \frac{-2.90 \times .54 - 2.95 \times .50}{3.90} - .82 = -1.60$$

$$M_{FG} = 1(-0.54 - \frac{1}{2} \times 0.50 + 1.60) = 0.81$$

$$M_{GF} = 1(-0.50 - \frac{1}{2} \times 0.54 + 1.60) = 0.83$$

Panel 7

$$1.76G - .26H = -0.87$$

$$-.20G + 1.78H = -0.83$$

$$G = -0.57 \quad H = -0.53$$

$$R_7 = \frac{-2.91 \times .57 - 2.96 \times 0.53}{3.91} - 0.87 = 1.70$$

$$M_{GH} = 1(-0.57 - \frac{1}{2} \times 0.53 + 1.70) = .87$$

$$M_{HG} = 1(-0.53 - \frac{1}{2} \times 0.57 + 1.70) = .89$$

Panel 8

$$1.76H - .26I = -0.90$$

$$-.17H + 1.92I = -0.81$$

$$H = -0.59 \quad I = -0.50$$

$$R_8 = \frac{-2.83 \times .59 - 2.91 \times .50}{3.83} - 0.90 = -1.71$$

$$M_{HI} = 1(-0.59 - \frac{1}{2} \times 0.50 + 1.71) = 0.87$$

$$M_{IH} = 1(-0.50 - \frac{1}{2} \times 0.59 + 1.71) = 0.93$$

1. The first part of the paper is devoted to a general discussion of the problem.

2. The second part is devoted to a detailed analysis of the case of a single particle.

3. The third part is devoted to a detailed analysis of the case of a system of particles.

4. The fourth part is devoted to a detailed analysis of the case of a system of particles.

5. The fifth part is devoted to a detailed analysis of the case of a system of particles.

6. The sixth part is devoted to a detailed analysis of the case of a system of particles.

7. The seventh part is devoted to a detailed analysis of the case of a system of particles.

8. The eighth part is devoted to a detailed analysis of the case of a system of particles.

9. The ninth part is devoted to a detailed analysis of the case of a system of particles.

10. The tenth part is devoted to a detailed analysis of the case of a system of particles.

11. The eleventh part is devoted to a detailed analysis of the case of a system of particles.

12. The twelfth part is devoted to a detailed analysis of the case of a system of particles.

13. The thirteenth part is devoted to a detailed analysis of the case of a system of particles.

14. The fourteenth part is devoted to a detailed analysis of the case of a system of particles.

15. The fifteenth part is devoted to a detailed analysis of the case of a system of particles.

16. The sixteenth part is devoted to a detailed analysis of the case of a system of particles.

17. The seventeenth part is devoted to a detailed analysis of the case of a system of particles.

18. The eighteenth part is devoted to a detailed analysis of the case of a system of particles.

19. The nineteenth part is devoted to a detailed analysis of the case of a system of particles.

20. The twentieth part is devoted to a detailed analysis of the case of a system of particles.

21. The twenty-first part is devoted to a detailed analysis of the case of a system of particles.

22. The twenty-second part is devoted to a detailed analysis of the case of a system of particles.

23. The twenty-third part is devoted to a detailed analysis of the case of a system of particles.

24. The twenty-fourth part is devoted to a detailed analysis of the case of a system of particles.

Panel 5

$$1.75E - .25F = -0.94$$

$$-.25E + 1.75F = -0.94$$

$$E = -0.63 \quad F = -0.63$$

$$R_5 = 3/4(-0.63 - 0.63) - 0.94 = -1.88$$

$$M_{EF} = 1(-0.63 - \frac{1}{2} \times 0.63 + 1.88) = .94$$

$$M_{FE} = 1(-0.63 - \frac{1}{2} \times 0.63 + 1.88) = .94$$

Panel 6

$$1.76F - .26G = -0.82$$

$$-.21F + 1.78G = -0.78$$

$$F = -0.54 \quad G = -0.50$$

$$R_6 = \frac{-2.90 \times .54 - 2.95 \times .50}{3.90} - .82 = -1.60$$

$$M_{FG} = 1(-0.54 - \frac{1}{2} \times 0.50 + 1.60) = 0.81$$

$$M_{GF} = 1(-0.50 - \frac{1}{2} \times 0.54 + 1.60) = 0.83$$

Panel 7

$$1.76G - .26H = -0.87$$

$$-.20G + 1.78H = -0.83$$

$$G = -0.57 \quad H = -0.53$$

$$R_7 = \frac{-2.91 \times .57 - 2.96 \times 0.53}{3.91} - 0.87 = 1.70$$

$$M_{GH} = 1(-0.57 - \frac{1}{2} \times 0.53 + 1.70) = .87$$

$$M_{HG} = 1(-0.53 - \frac{1}{2} \times 0.57 + 1.70) = .89$$

Panel 8

$$1.76H - .26I = -0.90$$

$$-.17H + 1.82I = -0.81$$

$$H = -0.59 \quad I = -0.50$$

$$R_8 = \frac{-2.83 \times .59 - 2.91 \times .50}{3.83} - 0.90 = -1.71$$

$$M_{HI} = 1(-0.59 - \frac{1}{2} \times 0.50 + 1.71) = 0.87$$

$$M_{IH} = 1(-0.50 - \frac{1}{2} \times 0.59 + 1.71) = 0.93$$

Joint Constant Computations - Load at C

Panel 1

$$1.82A - .17B = 4.89$$

$$-.26A + 1.76B = 5.38$$

$$A = 3.01 \quad B = 3.50$$

$$R_1 = \frac{2.91 \times 3.01 + 2.83 \times 3.50}{3.82} + 5.38 = 10.27$$

$$M_{AB} = (3.01 + \frac{3.50}{2} - 10.27) = -5.51$$

$$M_{BA} = (3.50 + \frac{3.01}{2} - 10.27) = -5.27$$

Panel 2

$$1.78B - .21C = 4.96$$

$$-.26B + 1.76C = 5.23$$

$$B = 3.20 \quad C = 3.44$$

$$R_2 = \frac{2.96 \times 3.20 + 2.91 \times 3.44}{3.92} + 5.23 = 10.21$$

$$M_{BC} = (3.20 + \frac{3.44}{2} - 10.21) = -5.29$$

$$M_{CB} = (3.44 + \frac{3.20}{2} - 10.21) = -5.17$$

Panel 3

$$1.78C - .21D = -2.36$$

$$-.26C + 1.76D = -2.38$$

$$C = -1.51 \quad D = -1.58$$

$$R_3 = \frac{-2.95 \times 1.51 - 2.90 \times 1.58}{3.90} - 2.38 = -4.70$$

$$M_{CD} = (-1.51 - \frac{1.58}{2} + 4.70) = 2.40$$

$$M_{DC} = (-1.58 - \frac{1.51}{2} + 4.70) = 2.37$$

Panel 4

$$1.75D - .25E = -1.87$$

$$-.26D + 1.75E = -1.87$$

$$D = -1.25 \quad E = -1.25$$

$$R_4 = 3/4(-1.25 - 1.25) - 1.87 = -3.74$$

$$M_{DE} = (-1.25 - \frac{1.25}{2} + 3.74) = 1.87$$

$$M_{ED} = (-1.25 - \frac{1.25}{2} + 3.74) = 1.87$$

Panel 5

$$E = -1.26$$

$$F = -1.26$$

$$R_5 = -3.76$$

$$M_{EF} = 1.88$$

$$M_{FE} = 1.88$$

Panel 6

$$F = -1.08$$

$$G = -1.00$$

$$R_6 = -3.20$$

$$M_{FG} = 1.62$$

$$M_{GF} = 1.66$$

Panel 7

$$G = -1.14$$

$$H = -1.06$$

$$R_7 = -3.40$$

$$M_{GH} = 1.74$$

$$M_{HG} = 1.78$$

Panel 8

$$H = -1.18$$

$$I = -1.00$$

$$R_8 = -3.42$$

$$M_{HI} = 1.74$$

$$M_{IH} = 1.86$$

Joint Constant Computation-Load at D

Panel 1

$$\begin{aligned} 1.82A - .17B &= 4.12 \\ -.26A + 1.76B &= 4.49 \\ A &= 2.54 \quad B = 2.92 \end{aligned}$$

$$R_1 = \frac{2.91 \times 2.54 + 2.83 \times 2.92 + 4.49}{3.82} = 8.59$$

$$M_{AB} = (2.54 + \frac{2.92}{2} - 8.59) = -4.59$$

$$M_{BA} = (2.92 + \frac{2.54}{2} - 8.59) = -4.50$$

Panel 2

$$\begin{aligned} 1.78B - .21C &= 4.14 \\ -.26B + 1.76C &= 4.36 \end{aligned}$$

$$B = 2.67 \quad C = 2.87$$

$$R_2 = \frac{2.96 \times 2.67 + 2.91 \times 2.87 + 4.36}{3.92} = 8.51$$

$$M_{BC} = (2.67 + \frac{2.87}{2} - 8.51) = -4.41$$

$$M_{CB} = (2.87 + \frac{2.67}{2} - 8.51) = -4.31$$

Panel 3

$$\begin{aligned} 1.78C - .21D &= 3.91 \\ -.26C + 1.76D &= 4.12 \end{aligned}$$

$$C = 2.52 \quad D = 2.71$$

$$R_3 = \frac{2.95 \times 2.52 + 2.90 \times 2.71 + 4.12}{3.90} = 8.04$$

$$M_{CD} = (2.52 + \frac{2.71}{2} - 8.04) = -4.17$$

$$M_{DC} = (2.71 + \frac{2.52}{2} - 8.04) = -4.07$$

Panel 4

$$\begin{aligned} 1.75D - .25E &= -2.82 \\ -.25D + 1.75E &= -2.82 \end{aligned}$$

$$D = -1.88 \quad E = -1.88$$

$$R_4 = \frac{3(-1.88 - 1.88) - 2.82}{4} = -5.64$$

$$M_{DE} = (-1.88 - \frac{1.88}{2} - 5.64) = 2.82$$

$$M_{ED} = (-1.88 - \frac{1.88}{2} - 5.64) = 2.82$$

Panel 5

$$\begin{aligned}E &= -1.89 \\F &= -1.89 \\R_5 &= -5.64 \\M_{EF} &= 2.82 \\M_{FE} &= 2.82\end{aligned}$$

Panel 6

$$\begin{aligned}F &= -1.62 \\G &= -1.50 \\R_6 &= 4.80 \\M_{FG} &= 2.43 \\M_{GF} &= 2.49\end{aligned}$$

Panel 7

$$\begin{aligned}G &= -1.71 \\H &= -1.59 \\R_7 &= -5.10 \\M_{GH} &= 2.61 \\M_{HG} &= 2.67\end{aligned}$$

Panel 8

$$\begin{aligned}H &= -1.77 \\I &= -1.50 \\R_8 &= -5.13 \\M_{HI} &= 2.61 \\M_{IH} &= 2.79\end{aligned}$$

Joint Constant Computation - Load at E

Panel 1

$$1.82A - .17B = 3.26$$

$$.26A + 1.76B = 3.59$$

$$A = 2.01 \quad B = 2.34$$

$$R_1 = \frac{2.91 \times 2.01 + 2.83 \times 2.34}{3.82} + 3.59 = 6.86$$

$$M_{AB} = (2.01 + \frac{2.34}{2} - 6.86) = -3.68$$

$$M_{BA} = (2.34 + \frac{2.01}{2} - 6.86) = -3.52$$

Panel 2

$$1.78B - .21C = 3.31$$

$$.26B + 1.76C = 3.49$$

$$B = 2.13 \quad C = 2.30$$

$$R_2 = \frac{2.96 \times 2.13 + 2.91 \times 2.30}{3.92} + 3.49 = 6.81$$

$$M_{BC} = (2.13 + \frac{2.30}{2} - 6.81) = -3.53$$

$$M_{CB} = (2.30 + \frac{2.13}{2} - 6.81) = -3.45$$

Panel 3

$$1.78C - .21D = 3.13$$

$$.26C + 1.76D = 3.30$$

$$C = 2.01 \quad D = 2.17$$

$$R_3 = \frac{2.95 \times 2.01 + 2.90 \times 2.17}{3.90} + 3.30 = 6.44$$

$$M_{CD} = (2.01 + \frac{2.17}{2} - 6.44) = -3.35$$

$$M_{DC} = (2.17 + \frac{2.01}{2} - 6.44) = -3.27$$

Panel 4

$$1.75D - .25E = 3.75$$

$$.25D + 1.75E = 3.75$$

$$D = 2.50 \quad E = 2.50$$

$$R_4 = 3/4(2.50 + 2.50) + 3.75 = 7.50$$

$$M_{DE} = (2.50 + \frac{2.50}{2} - 7.50) = -3.75$$

$$M_{ED} = (2.50 + \frac{2.50}{2} - 7.50) = -3.75$$

Panel 5

$$E = -2.52$$

$$F = -2.52$$

$$R_5 = -7.52$$

$$M_{EF} = 3.76$$

$$M_{FE} = 3.76$$

Panel 6

$$E = -2.16$$

$$G = -2.00$$

$$R_6 = -6.40$$

$$M_{EG} = 3.24$$

$$M_{GE} = 3.24$$

Panel 7

$$G = -2.28$$

$$F = -2.12$$

$$R_7 = -6.80$$

$$M_{GH} = 3.48$$

$$M_{HG} = 3.56$$

Panel 8

$$H = -2.06$$

$$G = -2.00$$

$$R_8 = -6.00$$

$$M_{HI} = 3.48$$

$$M_{IH} = 3.72$$

Moment Corrections - Load at PPl

Panel 1

$$1.82A - .17B = 0$$

$$-.26A + 1.76B = -1.22$$

$$A = -.07 \quad B = -.69$$

$$R_1 = \frac{-2.91 \times .07 - 2.83 \times .69}{3.83} = -.54$$

$$M_{AB} = 1(-.07 - \frac{1}{2} \times .69 + .54) = .12$$

$$M_{BA} = 1(-.69 - \frac{1}{2} \times .07 + .54) = -.18$$

Panel 2

$$1.78B - .20C = 6.16$$

$$-.26B + 1.76C = -1.21$$

$$B = 3.44 \quad C = -.18$$

$$R_2 = \frac{2.96 \times 3.44 - 2.91 \times .18}{3.91} = 2.47$$

$$M_{BC} = 1(3.44 - \frac{1}{2} \times .18 - 2.47) = .88$$

$$M_{CB} = 1(-.18 + \frac{1}{2} \times 3.44 - 2.47) = -.93$$

Panel 3

$$1.78C - .21D = -1.19$$

$$-.26C + 1.76D = -.94$$

$$C = -.74 \quad D = -.64$$

$$R_3 = \frac{-2.95 \times .74 - 2.90 \times .64}{3.90} = -1.04$$

$$M_{CD} = 1(-.74 - \frac{1}{2} \times .64 + 1.04) = -.02$$

$$M_{DC} = 1(-.64 - \frac{1}{2} \times .74 + 1.04) = .03$$

Panel 4

$$1.75D - .25E = -1.19$$

$$-.25D + 1.75E = -.94$$

$$D = -.77 \quad E = -.64$$

$$R_4 = 3/4(-.77 - .64) = -1.06$$

$$M_{DE} = 1(-.77 - \frac{1}{2} \times .64 + 1.06) = -.03$$

$$M_{ED} = 1(-.64 - \frac{1}{2} \times .77 + 1.06) = .03$$

Figure 1. The effect of the concentration of the *Agrobacterium* suspension on the transformation efficiency of *Agrobacterium* strains. The *Agrobacterium* strains were grown in the YEA medium for 24 h and then adjusted to the OD₆₀₀ of 0.1. The *Agrobacterium* strains were then grown in the YEA medium with the concentration of 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 3.0, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 4.0, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 5.0, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 6.0, 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8, 6.9, 7.0, 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, 7.8, 7.9, 8.0, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8, 8.9, 9.0, 9.1, 9.2, 9.3, 9.4, 9.5, 9.6, 9.7, 9.8, 9.9, 10.0, 10.1, 10.2, 10.3, 10.4, 10.5, 10.6, 10.7, 10.8, 10.9, 11.0, 11.1, 11.2, 11.3, 11.4, 11.5, 11.6, 11.7, 11.8, 11.9, 12.0, 12.1, 12.2, 12.3, 12.4, 12.5, 12.6, 12.7, 12.8, 12.9, 13.0, 13.1, 13.2, 13.3, 13.4, 13.5, 13.6, 13.7, 13.8, 13.9, 14.0, 14.1, 14.2, 14.3, 14.4, 14.5, 14.6, 14.7, 14.8, 14.9, 15.0, 15.1, 15.2, 15.3, 15.4, 15.5, 15.6, 15.7, 15.8, 15.9, 16.0, 16.1, 16.2, 16.3, 16.4, 16.5, 16.6, 16.7, 16.8, 16.9, 17.0, 17.1, 17.2, 17.3, 17.4, 17.5, 17.6, 17.7, 17.8, 17.9, 18.0, 18.1, 18.2, 18.3, 18.4, 18.5, 18.6, 18.7, 18.8, 18.9, 19.0, 19.1, 19.2, 19.3, 19.4, 19.5, 19.6, 19.7, 19.8, 19.9, 20.0, 20.1, 20.2, 20.3, 20.4, 20.5, 20.6, 20.7, 20.8, 20.9, 21.0, 21.1, 21.2, 21.3, 21.4, 21.5, 21.6, 21.7, 21.8, 21.9, 22.0, 22.1, 22.2, 22.3, 22.4, 22.5, 22.6, 22.7, 22.8, 22.9, 23.0, 23.1, 23.2, 23.3, 23.4, 23.5, 23.6, 23.7, 23.8, 23.9, 24.0, 24.1, 24.2, 24.3, 24.4, 24.5, 24.6, 24.7, 24.8, 24.9, 25.0, 25.1, 25.2, 25.3, 25.4, 25.5, 25.6, 25.7, 25.8, 25.9, 26.0, 26.1, 26.2, 26.3, 26.4, 26.5, 26.6, 26.7, 26.8, 26.9, 27.0, 27.1, 27.2, 27.3, 27.4, 27.5, 27.6, 27.7, 27.8, 27.9, 28.0, 28.1, 28.2, 28.3, 28.4, 28.5, 28.6, 28.7, 28.8, 28.9, 29.0, 29.1, 29.2, 29.3, 29.4, 29.5, 29.6, 29.7, 29.8, 29.9, 30.0, 30.1, 30.2, 30.3, 30.4, 30.5, 30.6, 30.7, 30.8, 30.9, 31.0, 31.1, 31.2, 31.3, 31.4, 31.5, 31.6, 31.7, 31.8, 31.9, 32.0, 32.1, 32.2, 32.3, 32.4, 32.5, 32.6, 32.7, 32.8, 32.9, 33.0, 33.1, 33.2, 33.3, 33.4, 33.5, 33.6, 33.7, 33.8, 33.9, 34.0, 34.1, 34.2, 34.3, 34.4, 34.5, 34.6, 34.7, 34.8, 34.9, 35.0, 35.1, 35.2, 35.3, 35.4, 35.5, 35.6, 35.7, 35.8, 35.9, 36.0, 36.1, 36.2, 36.3, 36.4, 36.5, 36.6, 36.7, 36.8, 36.9, 37.0, 37.1, 37.2, 37.3, 37.4, 37.5, 37.6, 37.7, 37.8, 37.9, 38.0, 38.1, 38.2, 38.3, 38.4, 38.5, 38.6, 38.7, 38.8, 38.9, 39.0, 39.1, 39.2, 39.3, 39.4, 39.5, 39.6, 39.7, 39.8, 39.9, 40.0, 40.1, 40.2, 40.3, 40.4, 40.5, 40.6, 40.7, 40.8, 40.9, 41.0, 41.1, 41.2, 41.3, 41.4, 41.5, 41.6, 41.7, 41.8, 41.9, 42.0, 42.1, 42.2, 42.3, 42.4, 42.5, 42.6, 42.7, 42.8, 42.9, 43.0, 43.1, 43.2, 43.3, 43.4, 43.5, 43.6, 43.7, 43.8, 43.9, 44.0, 44.1, 44.2, 44.3, 44.4, 44.5, 44.6, 44.7, 44.8, 44.9, 45.0, 45.1, 45.2, 45.3, 45.4, 45.5, 45.6, 45.7, 45.8, 45.9, 46.0, 46.1, 46.2, 46.3, 46.4, 46.5, 46.6, 46.7, 46.8, 46.9, 47.0, 47.1, 47.2, 47.3, 47.4, 47.5, 47.6, 47.7, 47.8, 47.9, 48.0, 48.1, 48.2, 48.3, 48.4, 48.5, 48.6, 48.7, 48.8, 48.9, 49.0, 49.1, 49.2, 49.3, 49.4, 49.5, 49.6, 49.7, 49.8, 49.9, 50.0, 50.1, 50.2, 50.3, 50.4, 50.5, 50.6, 50.7, 50.8, 50.9, 51.0, 51.1, 51.2, 51.3, 51.4, 51.5, 51.6, 51.7, 51.8, 51.9, 52.0, 52.1, 52.2, 52.3, 52.4, 52.5, 52.6, 52.7, 52.8, 52.9, 53.0, 53.1, 53.2, 53.3, 53.4, 53.5, 53.6, 53.7, 53.8, 53.9, 54.0, 54.1, 54.2, 54.3, 54.4, 54.5, 54.6, 54.7, 54.8, 54.9, 55.0, 55.1, 55.2, 55.3, 55.4, 55.5, 55.6, 55.7, 55.8, 55.9, 56.0, 56.1, 56.2, 56.3, 56.4, 56.5, 56.6, 56.7, 56.8, 56.9, 57.0, 57.1, 57.2, 57.3, 57.4, 57.5, 57.6, 57.7, 57.8, 57.9, 58.0, 58.1, 58.2, 58.3, 58.4, 58.5, 58.6, 58.7, 58.8, 58.9, 59.0, 59.1, 59.2, 59.3, 59.4, 59.5, 59.6, 59.7, 59.8, 59.9, 60.0, 60.1, 60.2, 60.3, 60.4, 60.5, 60.6, 60.7, 60.8, 60.9, 61.0, 61.1, 61.2, 61.3, 61.4, 61.5, 61.6, 61.7, 61.8, 61.9, 62.0, 62.1, 62.2, 62.3, 62.4, 62.5, 62.6, 62.7, 62.8, 62.9, 63.0, 63.1, 63.2, 63.3, 63.4, 63.5, 63.6, 63.7, 63.8, 63.9, 64.0, 64.1, 64.2, 64.3, 64.4, 64.5, 64.6, 64.7, 64.8, 64.9, 65.0, 65.1, 65.2, 65.3, 65.4, 65.5, 65.6, 65.7, 65.8, 65.9, 66.0, 66.1, 66.2, 66.3, 66.4, 66.5, 66.6, 66.7, 66.8, 66.9, 67.0, 67.1, 67.2, 67.3, 67.4, 67.5, 67.6, 67.7, 67.8, 67.9, 68.0, 68.1

1. *Pharmaceutical industry* – The pharmaceutical industry is a major contributor to the U.S. economy, with sales of over \$200 billion in 1997. The industry is highly competitive, with many firms competing for market share. The industry is also highly regulated, with the FDA overseeing the safety and efficacy of drugs. The industry is also highly innovative, with many new drugs being developed each year.

Panel 5

$$\begin{aligned} 1.75E - .25F &= -.94 \\ -.25E + 1.75F &= -.81 \end{aligned}$$

$$E = -.61$$

$$\begin{aligned} F &= -.54 \\ R_5 &= \frac{3}{4} (-.61 - .54) = -.86 \\ M_{EF} &= 1(-.61 - \frac{1}{2} \times .54 + .86) = -.02 \\ M_{FE} &= 1(-.54 - \frac{1}{2} \times .61 + .86) = .02 \end{aligned}$$

Panel 6

$$\begin{aligned} 1.76F - .26G &= -.94 \\ -.21F + 1.78G &= -.93 \end{aligned}$$

$$F = -.62$$

$$\begin{aligned} G &= -.56 \\ R_6 &= \frac{-2.90 \times .62 - 2.95 \times .56}{3.90} = -.88 \\ M_{FG} &= 1(-.62 - \frac{1}{2} \times .56 + .88) = 0 \\ M_{GF} &= 1(-.56 - \frac{1}{2} \times .62 + .88) = 0 \end{aligned}$$

Panel 7

$$\begin{aligned} 1.76G - .26H &= -.83 \\ -.20G + 1.78H &= -.87 \end{aligned}$$

$$G = -.55$$

$$H = -.55$$

$$\begin{aligned} R_7 &= \frac{-2.91 \times .55 - 2.96 \times .55}{3.91} = -.83 \\ M_{GH} &= 1(-.55 - \frac{1}{2} \times .55 + .83) = 0 \\ M_{HG} &= 1(-.55 - \frac{1}{2} \times .55 + .83) = 0 \end{aligned}$$

Panel 8

$$\begin{aligned} 1.76H - .26I &= -.89 \\ -.17H + 1.82I &= 0 \end{aligned}$$

$$H = -.51$$

$$I = -.05$$

$$\begin{aligned} R_8 &= \frac{-2.83 \times .51 - 2.91 \times .05}{3.83} = -.41 \\ M_{HI} &= 1(-.51 - \frac{1}{2} \times .05 + .42) = -.11 \\ M_{IH} &= 1(-.05 - \frac{1}{2} \times .51 + .42) = .11 \end{aligned}$$

Panel 1

$$1.82A - .17B = 0$$

$$-.26A + 1.76 = -.88$$

$$A = -.04$$

$$B = -.49$$

$$R_1 = \frac{-2.91 \times .04 - 2.83 \times .49}{3.83} = -.40$$

$$M_{AB} = (.04 - \frac{1}{2} \times .49 + .40) = .11$$

$$M_{BA} = (.49 - \frac{1}{2} \times .04 + .40) = -.11$$

Panel 3

$$1.78C - .21D = .93$$

$$-.26C + 1.76D = .03$$

$$C = .59$$

$$D = .10$$

$$R_3 = \frac{2.95 \times .59 - 2.90 \times .10}{3.90} = .52$$

$$M_{CD} = 1(.59 + \frac{1}{2} \times .10 - .52) = .12$$

$$M_{DC} = 1(.10 + \frac{1}{2} \times .59 - .52) = -.12$$

Load at B

| nel | 1 | | 2 | | 3 | | 4 | |
|-------|-------|-------|-------|-------|-------|-------|-------|------|
| | A | B | B | C | C | D | D | E |
| Q | 5.77 | 6.28 | -1.15 | -1.21 | -1.13 | -1.19 | -.94 | -.94 |
| Y | 3.56 | 4.09 | -.74 | -.80 | -.73 | -.78 | -.63 | -.63 |
| R | 2.03 | | -2.36 | | -2.33 | | -1.88 | |
| M' | -6.43 | -6.16 | 1.22 | 1.19 | 1.21 | 1.19 | 0.94 | 0.94 |
| Q | 0 | -1.22 | 6.16 | -1.21 | -1.19 | -.94 | -1.19 | -.94 |
| Y | -.07 | -.69 | 3.44 | -.18 | -.74 | -.64 | -.77 | -.64 |
| R | -.54 | | 2.47 | | -1.04 | | -1.06 | |
| M'' | .12 | -.18 | .88 | -.93 | -.02 | .03 | -.03 | .03 |
| Q | 0 | -.88 | | | -.93 | .03 | | |
| Y | -.04 | -.49 | | | .59 | .10 | | |
| R | -.40 | | | | .52 | | | |
| M''' | .11 | -.11 | 0 | 0 | .12 | -.12 | 0 | 0 |
| M'''' | -6.20 | -6.45 | 2.10 | .26 | 1.31 | 1.10 | .91 | .97 |

| Inel | 5 | | 6 | | 7 | | 8 | |
|------|-------|------|-------|------|-------|------|-------|------|
| | E | F | F | G | G | H | H | I |
| Q | -.94 | -.94 | -.82 | -.78 | -.87 | -.83 | -.90 | -.81 |
| | -.63 | -.63 | -.54 | -.50 | -.57 | -.53 | -.59 | -.50 |
| R | -1.88 | | -1.60 | | -1.70 | | -1.71 | |
| M' | .94 | .94 | .81 | .83 | .87 | .89 | .87 | .93 |
| Q | -.94 | -.81 | -.94 | -.87 | -.83 | -.87 | -.89 | 0 |
| | -.61 | -.54 | -.62 | -.56 | -.55 | -.55 | -.51 | -.05 |
| R | -.86 | | -.88 | | -.83 | | -.41 | |
| M'' | -.02 | .02 | 0 | 0 | 0 | 0 | -.11 | .11 |
| Q | | | | | | | | |
| R | | | | | | | | |
| M''' | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| M | .92 | .96 | .81 | .83 | .87 | .89 | .76 | 1.04 |

Moment Corrections Load at C

Panel 1

$$1.82A - .17B = 0$$

$$-.26A + 1.76B = 5.29$$

$$A = .29$$

$$B = 3.04$$

$$R_1 = \frac{2.91 \times .29 + 2.83 \times 3.04}{3.83} = 2.46$$

$$M_{AB} = 1(.29 + \frac{1}{2} \times 3.04 - 2.46) = -.65$$

$$M_{BC} = 1(3.04 + \frac{1}{2} \times .29 - 2.46) = .72$$

Panel 2

$$1.78B - .20C = 5.27$$

$$-.26B + 1.76 C = -2.40$$

$$B = 2.85$$

$$C = -.94$$

$$R_2 = \frac{2.96 \times 2.85 - 2.91 \times .94}{3.91} = 1.46$$

$$M_{BC} = 1(2.85 - \frac{1}{2} \times .94 - 1.46) = .92$$

$$M_{CB} = 1(-.94 + \frac{1}{2} \times 2.85 - 1.46) = -.98$$

Panel 3

$$1.78C - .21D = 5.17$$

$$-.26C + 1.76D = -1.87$$

$$C = 2.82$$

$$D = -.65$$

$$R_3 = \frac{2.95 \times 2.82 - 2.90 \times .65}{3.90} = 1.65$$

$$M_{CD} = 1(2.82 - \frac{1}{2} \times .65 - 1.65) = .85$$

$$M_{DC} = 1(-.65 + \frac{1}{2} \times 2.82 - 1.65) = -.89$$

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2. $W = \frac{1}{2} \rho v^2$

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16. $W = \frac{1}{2} \rho v^2$

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18. $W = \frac{1}{2} \rho v^2$

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22. $W = \frac{1}{2} \rho v^2$

23. $W = \frac{1}{2} \rho v^2$

24. $W = \frac{1}{2} \rho v^2$

25.

anel 4

$$1.75D - .25E = -2.37$$

$$-.25D + 1.75E = -1.88$$

$$D = -1.54$$

$$E = -1.30$$

$$R_4 = \frac{3}{4} (-1.54 - 1.30) = -2.13$$

$$M_{DE} = 1(-1.54 - \frac{1}{2} \times 1.30 + 2.13) = -.06$$

$$M_{ED} = 1(-1.30 - \frac{1}{2} \times 1.54 + 2.13) = .06$$

anel 5

$$1.75 - .25F = -1.87$$

$$-.25E + 1.75F = -1.62$$

$$E = -1.23$$

$$F = -1.10$$

$$R_5 = \frac{3}{4} (-1.23 - 1.10) = -1.75$$

$$M_{EF} = 1(-1.23 - \frac{1}{2} \times 1.10 + 1.75) = -.03$$

$$M_{FE} = 1(-1.10 - \frac{1}{2} \times -1.23 + 1.75) = .03$$

anel 6

$$1.76F - .26G = -1.88$$

$$-.21F + 1.78G = -1.74$$

$$F = -1.22$$

$$G = -1.12$$

$$R_6 = \frac{-2.90 \times 1.22 - 2.95 \times 1.12}{3.90} = -1.75$$

$$M_{FG} = 1(-1.22 - \frac{1}{2} \times 1.12 + 1.75) = -.03$$

$$M_{GF} = 1(-1.12 - \frac{1}{2} \times 1.22 + 1.75) = .02$$

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Panel 7

$$1.76G - .26H = -1.66$$

$$-.20G + 1.78H = -1.74$$

$$G = -1.10$$

$$H = -1.10$$

$$R_7 = \frac{-2.91 \times 1.10 - 2.96 \times 1.10}{3.91} = -1.65$$

$$M_{GH} = 1(-1.10 - \frac{1}{2} \times 1.10 + 1.65) = 0$$

$$M_{HG} = 1(-1.10 - \frac{1}{2} \times 1.10 + 1.65) = 0$$

Panel 8

$$1.76H - .26I = -1.78$$

$$-.17H + 1.82I = 0$$

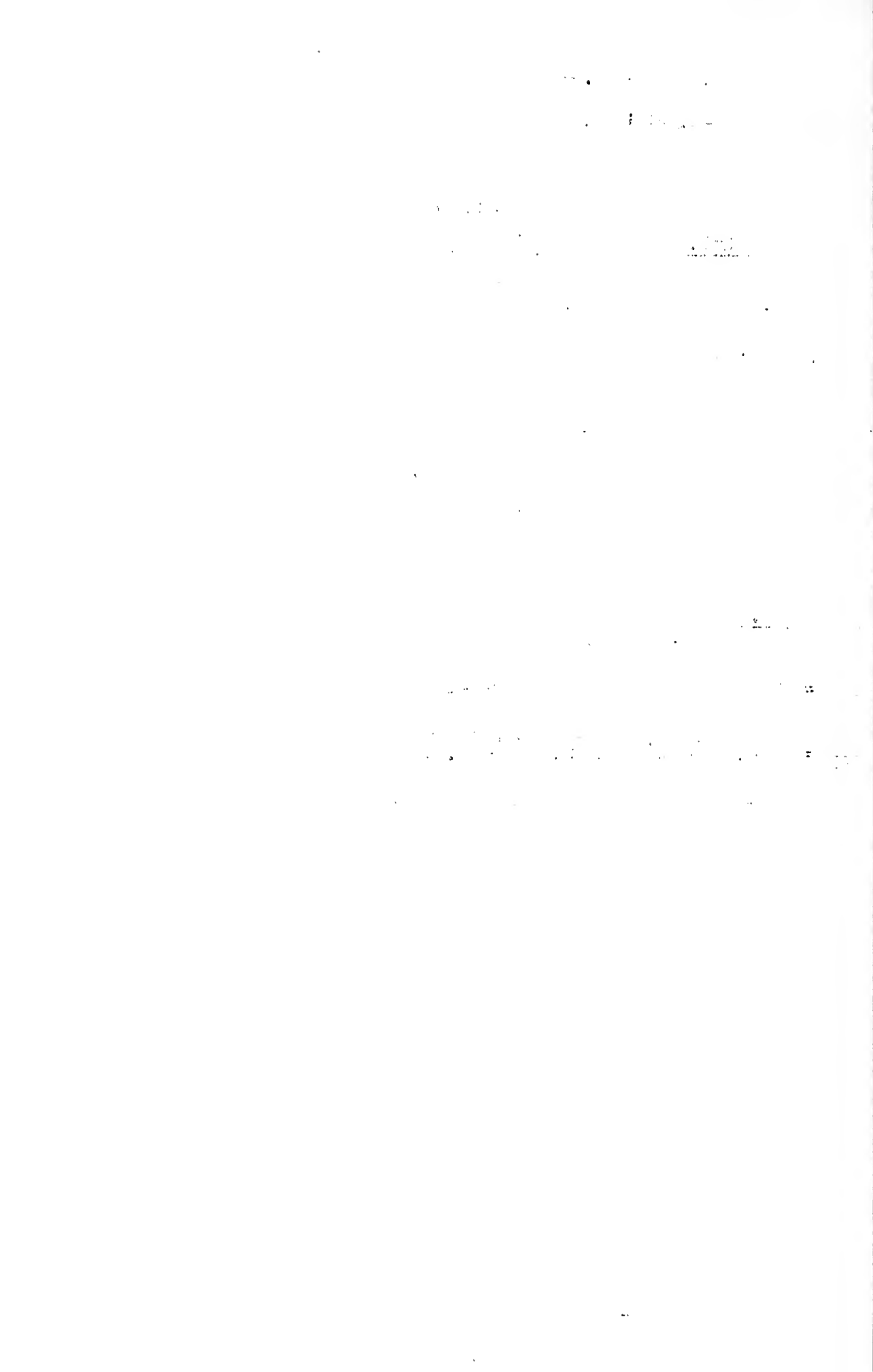
$$H = -1.02$$

$$I = -0.10$$

$$R_8 = \frac{-2.83 \times 1.02 - 2.91 \times .10}{3.83} = -.83$$

$$M_{HI} = 1(-1.02 - \frac{1}{2} \times .10 + .83) = -.24$$

$$M_{IH} = 1(-.10 - \frac{1}{2} \times 1.02 + .83) = .22$$



$$\begin{aligned}\text{Panel 1} \quad & 1.82A - .17B = 0 \\ & -.26A + 1.76B = -.92 \\ & A = -.05 \quad B = -.53\end{aligned}$$

$$R_1 = \frac{-2.91 \times .05 - 2.83 \times .53}{3.83} = -.43$$

$$M_{AB} = 1(-.05 - \frac{1}{2} \times .53 + .43) = .11$$

$$M_{BA} = 1(-.53 - \frac{1}{2} \times .05 + .43) = -.11$$

$$\begin{aligned}\text{Panel 2} \quad & 1.78B - .20C = -.72 \\ & -.26B + 1.76C = -.85 \\ & B = -.46 \quad C = -.55\end{aligned}$$

$$R_2 = \frac{-2.96 \times .46 - 2.91 \times .55}{3.91} = -.76$$

$$M_{BC} = 1(-.46 - \frac{1}{2} \times .55 + .76) = .02$$

$$M_{CB} = 1(-.55 - \frac{1}{2} \times .46 + .76) = -.02$$

$$\begin{aligned}\text{Panel 3} \quad & 1.78C - .21D = .98 \\ & -.26C + 1.76D = .06 \\ & C = .56 \quad D = .12\end{aligned}$$

$$R_3 = \frac{2.95 \times .56 + 2.90 \times .12}{3.90} = .57$$

$$M_{CD} = 1(.56 + \frac{1}{2} \times .12 - .51) = .11$$

$$M_{DC} = 1(.12 + \frac{1}{2} \times .56 - .51) = -.11$$

$$\begin{aligned}\text{Panel 4} \quad & 1.75D - .25E = .89 \\ & -.25D + 1.75E = .03 \\ & D = .52 \quad E = .09\end{aligned}$$

$$R_4 = 3/4(.52 + .09) = .46$$

$$M_{DE} = 1(.52 + \frac{1}{2} \times .09 - .46) = .11$$

$$M_{ED} = 1(.09 + \frac{1}{2} \times .52 - .46) = -.11$$

Load at C

| Panel | 1 | | 2 | | 3 | | 4 | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Joint | A | B | B | C | C | D | D | E |
| Q | 4.89 | 5.38 | 4.96 | 5.23 | -2.36 | -2.38 | -1.87 | -1.87 |
| x | 3.01 | 3.50 | 3.20 | 3.44 | -1.51 | -1.58 | -1.25 | -1.25 |
| R | 10.27 | | 10.21 | | -4.70 | | -3.74 | |
| M' | -5.41 | -5.27 | -5.29 | -5.17 | 2.40 | 2.37 | 1.87 | 1.87 |
| Q | 0 | 5.29 | 5.27 | -2.40 | 5.17 | -1.87 | -2.37 | -1.88 |
| x | .29 | 3.04 | 2.85 | -.94 | 2.82 | -.65 | -1.54 | -1.30 |
| R | 2.46 | | 1.46 | | 1.65 | | -2.13 | |
| M'' | -.65 | .72 | .92 | -.98 | .85 | -.89 | -.06 | .06 |
| Q | 0 | -.92 | -.72 | -.85 | .98 | .06 | .89 | .03 |
| x | -.05 | -.53 | -.46 | -.55 | .56 | .12 | .52 | .09 |
| R | -.43 | | -.76 | | .51 | | .46 | |
| M''' | .11 | -.11 | .02 | -.02 | .11 | -.11 | .11 | -.11 |
| M | -6.05 | -4.65 | -4.35 | -6.17 | 3.36 | 1.37 | 1.92 | 1.82 |

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is essential for ensuring transparency and accountability in the organization's operations.

2. The second part of the document outlines the various methods and tools used to collect and analyze data. It includes a detailed description of the data collection process, from identifying the sources of data to the actual collection and storage of the data.

3. The third part of the document describes the various methods and tools used to analyze the data. It includes a detailed description of the data analysis process, from identifying the key variables to the actual analysis and interpretation of the results.

4. The fourth part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is essential for ensuring transparency and accountability in the organization's operations.

5. The fifth part of the document outlines the various methods and tools used to collect and analyze data. It includes a detailed description of the data collection process, from identifying the sources of data to the actual collection and storage of the data.

6. The sixth part of the document describes the various methods and tools used to analyze the data. It includes a detailed description of the data analysis process, from identifying the key variables to the actual analysis and interpretation of the results.

7. The seventh part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is essential for ensuring transparency and accountability in the organization's operations.

8. The eighth part of the document outlines the various methods and tools used to collect and analyze data. It includes a detailed description of the data collection process, from identifying the sources of data to the actual collection and storage of the data.

9. The ninth part of the document describes the various methods and tools used to analyze the data. It includes a detailed description of the data analysis process, from identifying the key variables to the actual analysis and interpretation of the results.

10. The tenth part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is essential for ensuring transparency and accountability in the organization's operations.

| 5 | | 6 | | 7 | | 8 | |
|-------|-------|-------|-------|-------|-------|-------|-------|
| L | F | F | G | G | H | H | I |
| -1.88 | -1.88 | -1.64 | -1.56 | -1.74 | -1.66 | -1.80 | -1.62 |
| -1.26 | -1.26 | -1.08 | -1.00 | -1.14 | -1.06 | -1.18 | -1.10 |
| -3.76 | | -3.20 | | -3.40 | | -3.42 | |
| 1.88 | 1.88 | 1.62 | 1.66 | 1.74 | 1.78 | 1.74 | 1.86 |
| -1.87 | -1.62 | -1.88 | -1.74 | -1.66 | -1.74 | -1.78 | 0 |
| -1.23 | -1.10 | -1.22 | -1.12 | -1.10 | -1.10 | -1.02 | - .10 |
| -1.75 | | -1.75 | | -1.65 | | - .83 | |
| - .03 | .03 | - .03 | .02 | 0 | 0 | - .24 | .22 |
| - .06 | .03 | - .03 | 0 | - .02 | .24 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.85 | 1.91 | 1.59 | 1.68 | 1.74 | 1.78 | 1.50 | 2.08 |

Influence Line Corrections - First Set

Panel 1

Load at D

$$1.82A - .17B = 0$$

$$-.26A + 1.76B = 4.41$$

$$A = .24$$

$$B = 2.54$$

$$R_1 = 2.06$$

$$M_{AB} = (.24 + \frac{2.54}{2} - 2.06) = -.57$$

$$M_{BA} = (2.54 + \frac{.24}{2} - 2.06) = -.59$$

Panel 2

$$1.78B - .21C = 4.40$$

$$-.26B + 1.76C = 4.17$$

$$B = 2.80$$

$$C = 2.78$$

$$R_2 = 4.18$$

$$M_{BC} = (2.80 + \frac{2.78}{2} - 4.18) = 0$$

$$M_{CB} = (2.78 + \frac{2.80}{2} - 4.18) = 0$$

Panel 3

$$1.78C - .21D = 4.31$$

$$-.26C + 1.76D = -2.82$$

$$C = 2.27$$

$$D = -1.27$$

$$R_3 = .78$$

$$M_{CD} = (2.27 - \frac{1.27}{2} - .78) = .86$$

$$M_{DC} = (-1.27 + \frac{2.27}{2} - .78) = -.92$$

Panel 4

$$1.75D - .25E = 4.07$$

$$-.25D + 1.75E = -2.82$$

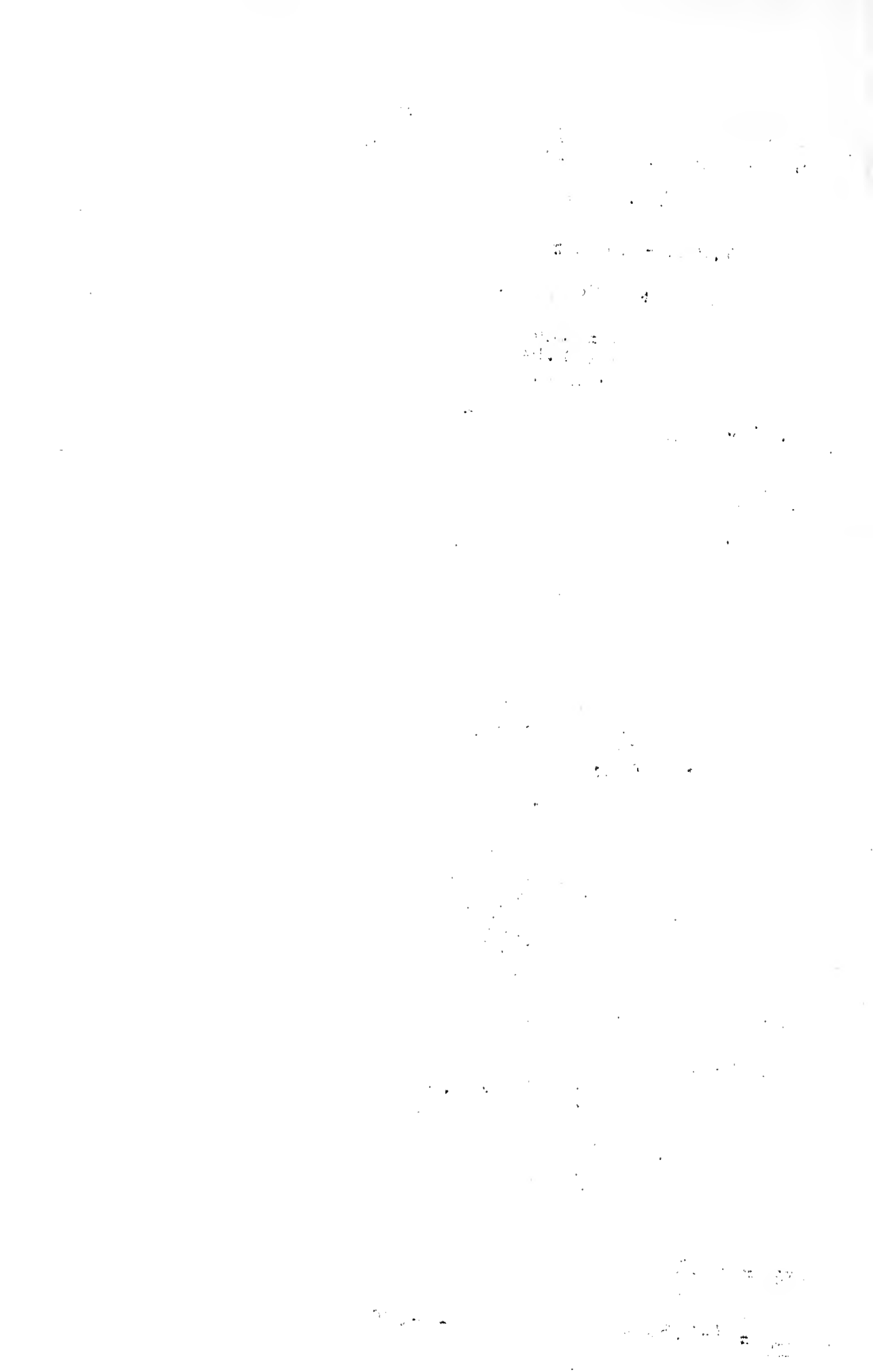
$$D = 2.14$$

$$E = -1.30$$

$$R_4 = .63$$

$$M_{DE} = (2.14 - \frac{1.30}{2} - .63) = .86$$

$$M_{ED} = (-1.30 + \frac{2.14}{2} - .63) = -.86$$



anel 5

$$\begin{aligned}-.25F + 1.75E &= -2.82 \\ 1.75F - .25E &= -2.43\end{aligned}$$

$$\begin{aligned}E &= -1.85 \\ F &= -1.65 \\ R_5 &= -2.63\end{aligned}$$

$$M_{EF} = (-1.85 - \frac{1.65}{2} + 2.63) = -.04$$

$$M_{FE} = (-1.65 - 1.85 + 2.63) = .06$$

anel 6

$$\begin{aligned}-.26G + 1.76F &= -2.82 \\ 1.78G - .21F &= -2.61\end{aligned}$$

$$\begin{aligned}F &= -1.85 \\ G &= -1.69 \\ R_6 &= -2.66\end{aligned}$$

$$M_{FG} = (-1.85 - \frac{1.69}{2} + 2.66) = -.03$$

$$M_{GF} = (-1.69 - \frac{1.85}{2} + 2.66) = .05$$

anel 7

$$\begin{aligned}-.26H + 1.76G &= -2.49 \\ 1.78H - .21G &= -2.61\end{aligned}$$

$$\begin{aligned}G &= -1.66 \\ H &= -1.66 \\ R_7 &= -2.49\end{aligned}$$

$$M_{GH} = (-1.66 - \frac{1.66}{2} + 2.49) = 0$$

$$M_{HG} = (-1.66 - \frac{1.66}{2} + 2.49) = 0$$

anel 8

$$\begin{aligned}-.26I + 1.76H &= -2.67 \\ 1.82I - .17H &= 0\end{aligned}$$

$$\begin{aligned}H &= -1.54 \\ I &= -.14 \\ R_8 &= -1.25\end{aligned}$$

$$M_{HI} = (-1.54 - \frac{.14}{2} + 1.25) = -.36$$

$$M_{IH} = (-.14 - \frac{1.54}{2} + 1.25) = .34$$

Influence Line Corrections-Load at D

Second Set

Panel 1

0

Panel 2

$$1.78B - .21C = .59$$

$$-.26B + 1.76C = -.86$$

$$B = -.40$$

$$C = -.55$$

$$R_2 = -.71$$

$$M_{BC} = (-.40 - \frac{.55}{2} + .71) = .04$$

$$M_{CB} = (-.55 - \frac{.40}{2} + .71) = -.04$$

Panel 3

$$1.78C - .21D = 0$$

$$-.26C + 1.76D = -.86$$

$$C = -.06$$

$$D = -.50$$

$$R_3 = -.42$$

$$M_{CD} = (-.06 - \frac{.50}{2} + .42) = .11$$

$$M_{DC} = (-.50 - \frac{.06}{2} + .42) = -.11$$

Panel 4

$$1.75D - .25E = .92$$

$$-.25D + 1.75E = .04$$

$$D = .54$$

$$E = .10$$

$$R_4 = .43$$

$$M_{DE} = (.54 + \frac{.10}{2} - .43) = .11$$

$$M_{ED} = (.10 + .54 - .43) = .11$$

Panel 5

$$-.25F + 1.75E = .86$$

$$1.75F - .25E = .03$$

$$E = .50$$

$$F = .09$$

$$R_5 = .44$$

$$M_{EF} = (.50 + \frac{.09}{2} - .44) = .10$$

$$M_{FE} = (.09 + \frac{.50}{2} - .44) = -.10$$

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Panel 6

$$-.26G + 1.76F = -.06$$

$$1.78G - .21F = 0$$

$$F = -.35 \quad G = 0$$

$$M_{FG} = (-.35 - 0 + .26) = -.09$$

$$M_{GF} = (0 - .35 + .26) = .09$$

Panel 7

$$-.26H + 1.76G = -.03$$

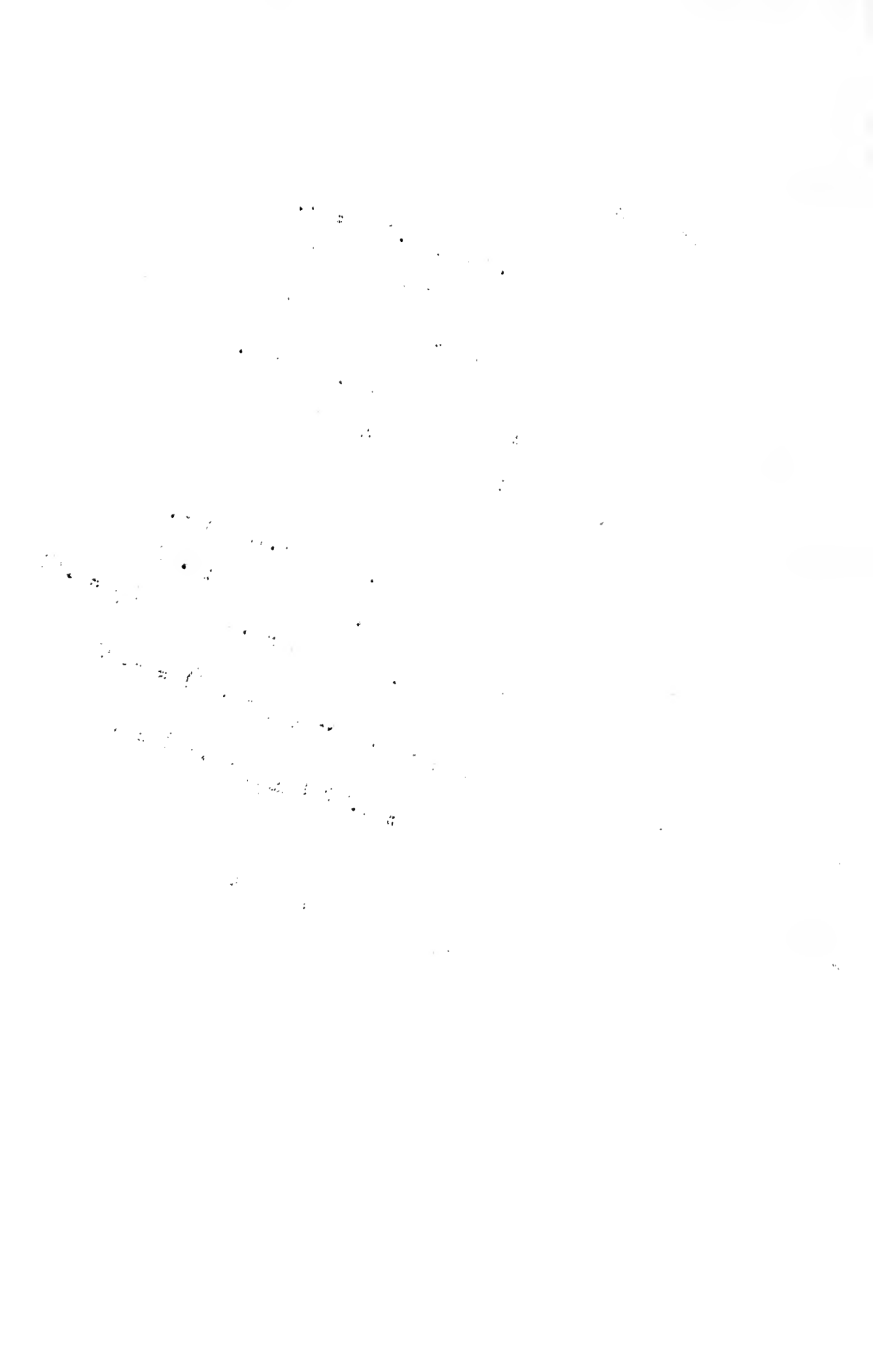
$$1.78H - .21G = .36$$

$$G = .01 \quad H = .20 \quad R_7 = .16$$

$$M_{GH} = (.01 + \frac{.20}{2} - .16) = -.05$$

$$M_{HG} = (.20 + \frac{.01}{2} - .16) = .04$$

Panel 8 = 0



LOAD AT D

| Panel
Point | 1 | | 2 | | 3 | | 4 | |
|--------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | A | B | B | C | C | D | D | E |
| -Q

R
M' | 4.12 | 4.49 | 4.14 | 4.36 | 3.91 | 4.12 | 2.82 | -2.82 |
| | 2.54 | 2.92 | 2.67 | 2.87 | 2.52 | 2.71 | -1.88 | -1.88 |
| | 8.59 | | 8.51 | | 8.04 | | -5.64 | |
| | -4.59 | -4.40 | -4.41 | -4.31 | -4.17 | -4.07 | 2.82 | 2.82 |
| -Q

R
M'' | 0 | 4.41 | 4.40 | 4.17 | 4.31 | -2.82 | 4.07 | -2.82 |
| | .24 | 2.54 | 2.80 | 2.78 | 2.27 | -1.27 | 2.14 | -1.30 |
| | 2.06 | | 4.18 | | .78 | | .63 | |
| | -.57 | .59 | 0 | 0 | .86 | -.92 | .86 | -.86 |
| -Q

R
M'' | 0 | 0 | -.59 | -.86 | 0 | -.86 | .92 | .04 |
| | | | -.40 | -.55 | -.06 | -.50 | .54 | .10 |
| | | | -.71 | | -.42 | | .48 | |
| | 0 | 0 | .04 | -.04 | .11 | -.11 | .11 | -.11 |
| M | -5.16 | -3.81 | -4.37 | -4.35 | -3.20 | -5.10 | 3.79 | 1.85 |

| Panel | 5 | | 6 | | 7 | | 8 | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Point | E | F | F | G | G | H | H | I |
| -Q | -2.82 | -2.82 | -2.46 | -2.34 | -2.61 | -2.49 | -2.70 | -2.43 |
| Q | -1.89 | -1.82 | -1.62 | -1.50 | -1.71 | -1.59 | -1.77 | -1.50 |
| R | -5.34 | | -4.80 | | -5.10 | | -5.13 | |
| M' | 2.82 | 2.82 | 2.43 | 2.49 | 2.61 | 2.67 | 2.61 | 2.79 |
| -Q | -2.82 | -2.43 | -2.32 | -2.61 | -2.49 | -2.61 | -2.67 | 0 |
| Q | -1.85 | -1.65 | -1.69 | -1.85 | -1.66 | -1.66 | -1.54 | -.14 |
| R | -2.63 | | -2.66 | | -2.49 | | -1.25 | |
| M'' | -.04 | .06 | -.03 | .05 | 0 | 0 | -.36 | .34 |
| -Q | .86 | .05 | .06 | 0 | -.03 | .36 | 0 | 0 |
| Q | .50 | .09 | -.35 | 0 | .01 | .20 | | |
| R | .44 | | -.26 | | .15 | | | |
| M'' | .10 | -.10 | -.09 | .09 | -.05 | .04 | 0 | 0 |
| ΣM | 2.88 | 2.78 | 2.33 | 2.61 | 2.53 | 2.71 | 2.25 | 3.13 |

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Influence Line Corrections-Load at E
First Set

Panels 1,8

$$1.82A - .17B = 0$$

$$-.26A + 1.76B = 3.53$$

$$A = -.19 \quad B = 2.03 \quad R_1 = 1.65$$

$$M_{AB} = (.19 + \frac{2.03}{2} - 1.65) = -.45$$

$$M_{BA} = (2.03 + \frac{.19}{2} - 1.65) = .47$$

Panel 2,7

$$1.78B - .21C = 3.48$$

$$-.26B + 1.76C = 3.24$$

$$B = 2.21 \quad C = 2.17 \quad R_2 = 3.28$$

$$M_{BC} = (2.21 + \frac{2.17}{2} - 3.28) = .01$$

$$M_{CB} = (2.17 + \frac{2.21}{2} - 3.28) = -.01$$

Panels 3,6

$$1.78C - .21D = 3.45$$

$$-.26C + 1.76D = 3.76$$

$$C = 2.23 \quad D = 2.46 \quad R_3 = 3.52$$

$$M_{CD} = (2.23 + \frac{2.46}{2} - 3.52) = -.06$$

$$M_{DC} = (2.46 + \frac{2.23}{2} - 3.52) = .05$$

Panels 4,5

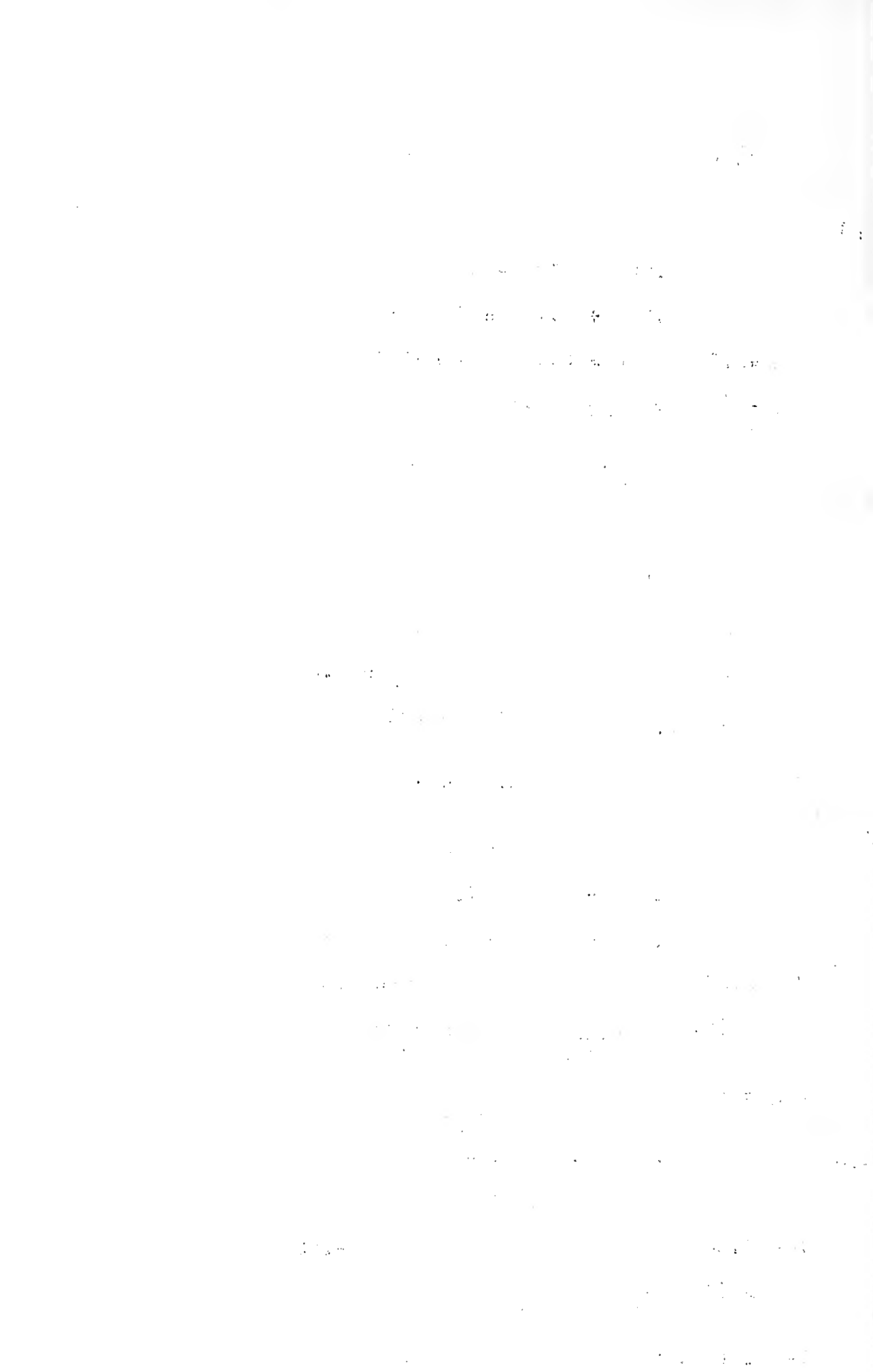
$$1.75D - .25E = 3.24$$

$$-.25D + 1.75E = -3.76$$

$$D = 1.58 \quad E = -1.92 \quad R_4 = -.25$$

$$M_{DE} = (1.58 + \frac{1.92}{2} + .25) = .87$$

$$M_{ED} = (-1.92 + \frac{1.58}{2} + .25) = -.88$$



Influence Line Corrections-Load at E
Second Set

panels 1,8

0

panels 2,7

$$1.78B - .21C = -.47$$

$$-.26B + 1.76C = .06$$

$$B = -.26 \quad C = -.01 \quad R_2 = -.20$$

$$M_{BC} = (.01 - \frac{.26}{2} + .20) = .06$$

$$M_{CB} = (-.01 - .26 + 2.0) = .06$$

panels 3,6

$$1.75C - .21D = .01$$

$$-.26C + 1.76D = -.87$$

$$C = -.05 \quad D = -.50 \quad R_3 = -.41$$

$$M_{CD} = (.05 - \frac{.50}{2} + .41) = .11$$

$$M_{DC} = (-.50 - \frac{.05}{2} + .41) = -.11$$

panels 4,5

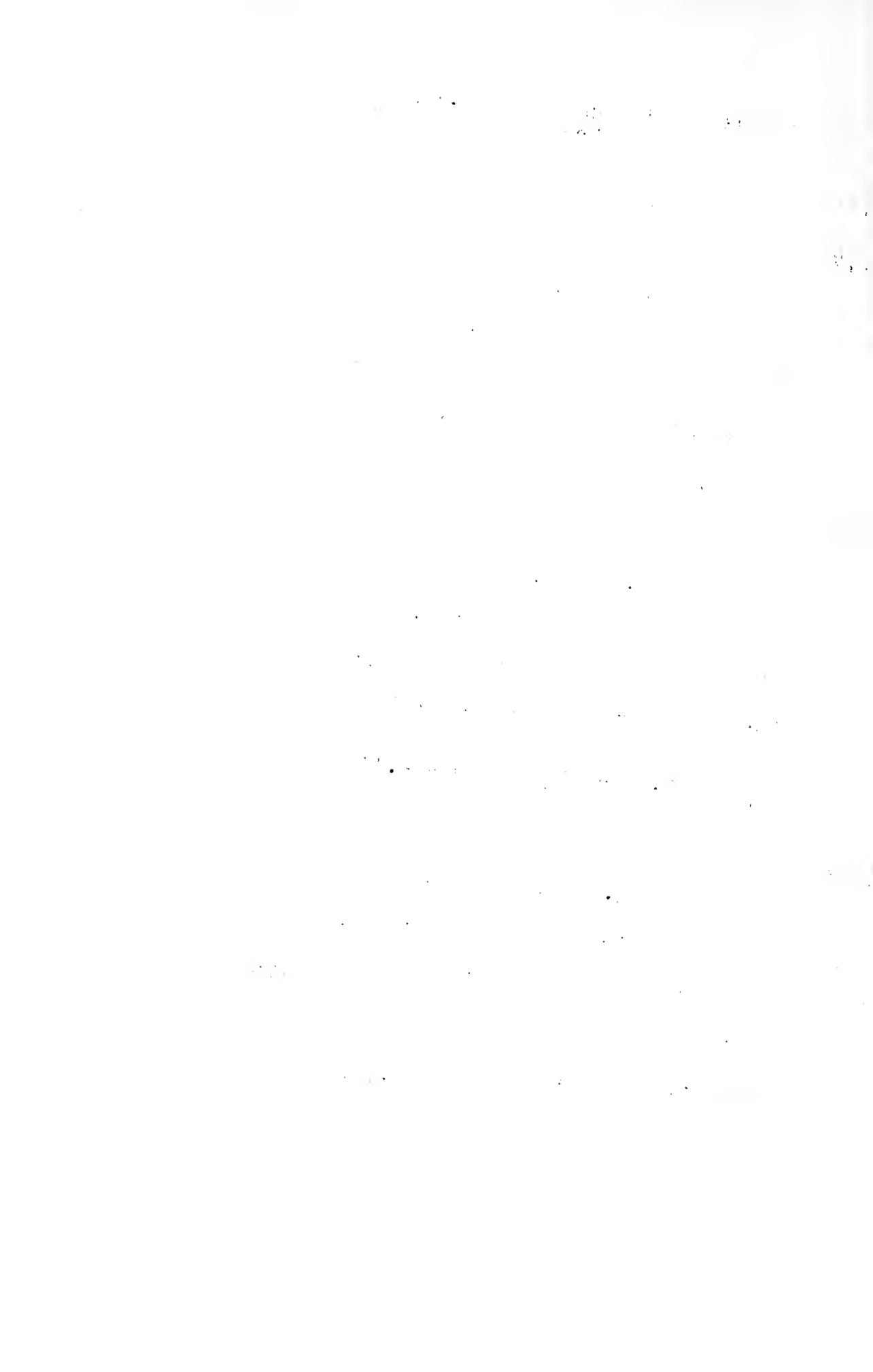
$$1.75D - .25E = -.05$$

$$-.25D + 1.75E = -.88$$

$$D = -.10 \quad E = -.52 \quad R_4 = -.46$$

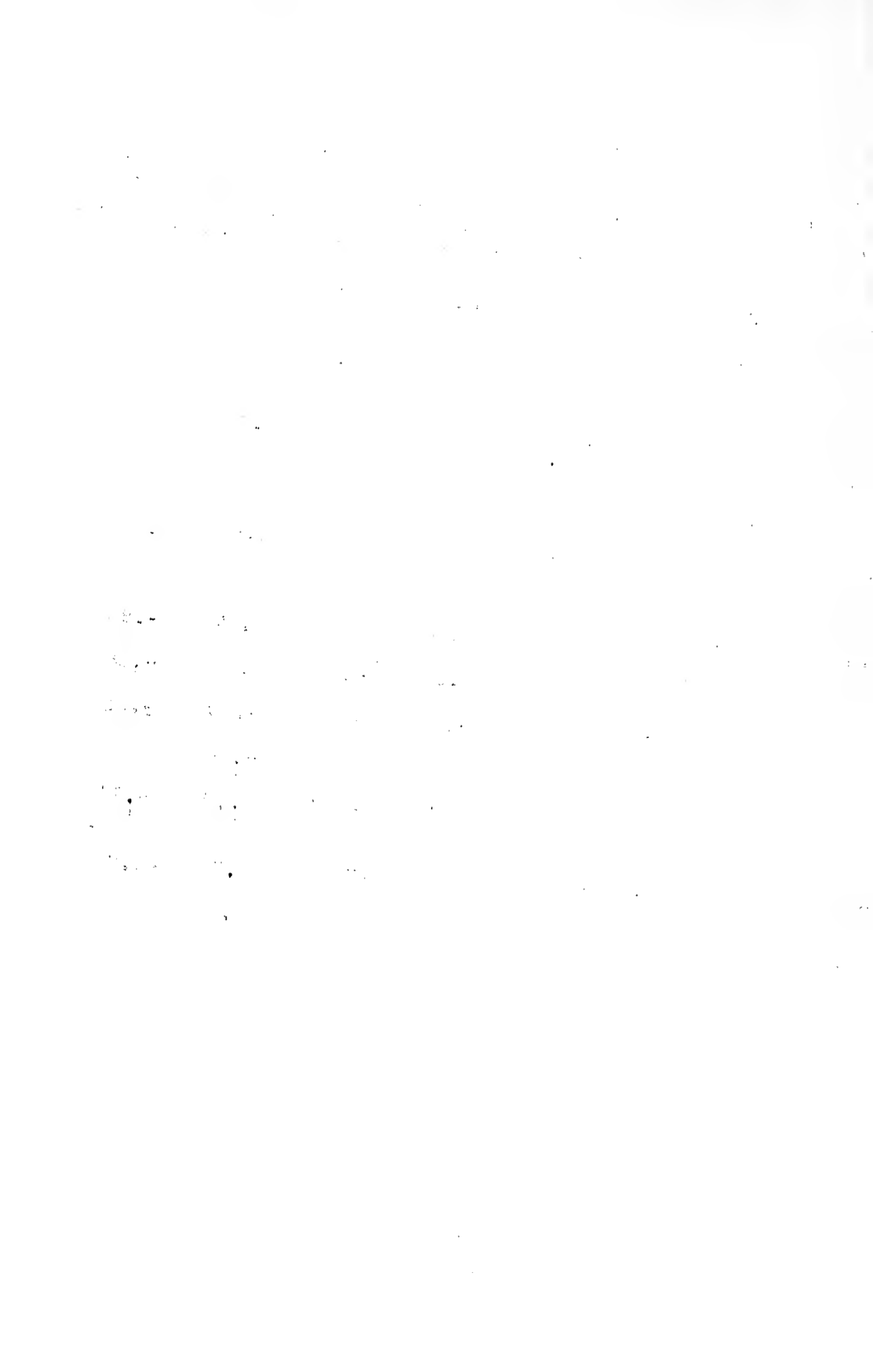
$$M_{DE} = (-.10 - \frac{.52}{2} + .46) = .10$$

$$M_{ED} = (-.52 - \frac{.10}{2} + .46) = -.11$$



Load at E

| Inel
Int | 1 | | 2 | | 3 | | 4 | |
|-------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | A | B | B | C | C | D | D | E |
| | 3.24 | 3.60 | 3.32 | 3.48 | 3.12 | 3.28 | 3.76 | 3.76 |
| | 2.00 | -2.36 | 2.12 | 2.28 | 2.00 | 2.16 | 2.52 | 2.52 |
| | 6.84 | | 6.81 | | 6.40 | | 7.52 | |
| | -3.72 | -3.48 | -3.53 | -3.45 | -3.24 | -3.24 | -3.76 | -3.76 |
| | 0 | 3.53 | 3.48 | 3.24 | 3.45 | 3.76 | 3.24 | -3.76 |
| | .19 | 2.03 | 2.51 | 2.17 | 2.23 | 2.46 | 1.58 | -1.92 |
| | 1.65 | | 3.28 | | 3.52 | | -.25 | |
| | -.45 | .47 | .01 | -.01 | -.06 | .05 | .87 | -.88 |
| | 0 | -.01 | -.47 | .06 | .01 | -.87 | -.05 | -.88 |
| | | | -.26 | -.01 | -.05 | -.50 | -.10 | -.52 |
| | | | -.20 | | -.41 | | -.46 | |
| | | | -.06 | .06 | .11 | -.11 | .10 | -.11 |
| | -4.17 | -3.01 | -3.58 | -3.40 | -3.19 | -3.30 | -2.79 | -4.75 |



Moment Computations

| | | |
|---------------|---------------|--------------|
| Member AA' | DL | = 3422 fk |
| | LL E-60 | = 3005 |
| | Impact | = <u>643</u> |
| | Total | 7070 |
| LL H15-S12-44 | | = 401 |
| Conc. | | = 91 |
| Impact | | = <u>68</u> |
| | Total | 560 |
| Sidewalk | | = 259 |
| | Design Moment | = 7,869 fk |
| Member BB' | DL | = 4680 fk |
| | LL E-60 | = 3990 |
| | Impact | = <u>835</u> |
| | Total | 9505 |
| LL H15-S12-44 | | = 548 |
| Conc. | | = 128 |
| Impact | | = <u>93</u> |
| | Total | 769 |
| Sidewalk | | = 326 |
| | Design Moment | = 10,600 fk |
| Member CC' | DL | = 3230 fk |
| | LL E-60 | = 2945 |
| | Impact | = <u>728</u> |
| | Total | 6903 |
| LL H15-S12-44 | | = 384 |
| Conc. | | = 115 |
| Impact | | = <u>82</u> |
| | Total | 581 |
| Sidewalk | | = 247 |
| | Design Moment | = 7,781 fk |

| nel
Int | 5 | | 6 | | 7 | | 8 | |
|------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | E | F | F | G | G | H | H | I |
| -Q | -3.76 | -3.76 | -3.28 | -3.12 | -3.48 | -3.32 | -3.60 | -3.24 |
| C | -2.52 | -2.52 | -2.16 | -2.00 | -2.28 | -2.12 | -2.36 | -2.00 |
| R | -7.52 | | -6.40 | | -6.81 | | -6.84 | |
| M' | 3.76 | 3.76 | 3.24 | 3.24 | 3.45 | 3.53 | 3.48 | 3.72 |
| -Q | 3.76 | -3.23 | -3.76 | -3.45 | -3.24 | -3.48 | -3.53 | 0 |
| i | 1.92 | -1.58 | -2.46 | -2.23 | -2.17 | -2.21 | -2.03 | -.19 |
| R | .25 | | -3.52 | | -3.28 | | -1.65 | |
| M'' | .88 | -.87 | -.05 | .06 | .01 | -.01 | -.47 | .45 |
| Q | .88 | .05 | .87 | -.01 | -.06 | .47 | .01 | 0 |
| C | .52 | .10 | .50 | .05 | .01 | .26 | | |
| R | .46 | | .41 | | .20 | | | |
| M'' | .11 | -.10 | .11 | -.11 | -.06 | .06 | 0 | 0 |
| M | 4.75 | 2.79 | 3.30 | 3.19 | 3.40 | 3.58 | 3.01 | 4.17 |
| | | | | | | | | |
| | | | | | | | | |

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Member DL'

| | | | |
|---------------|---|------------|----|
| DL | = | 2132 | fk |
| LL-E60 | = | 1950 | |
| Impact | = | <u>536</u> | |
| Total | = | 4618 | |
| LL-H15-S12-44 | = | 240 | |
| Conc. | = | 88 | |
| Impact | = | <u>53</u> | |
| Total | = | 381 | |
| Sidewalk | = | 171 | |
| Design Moment | = | 5,170 | fk |

Member EE'

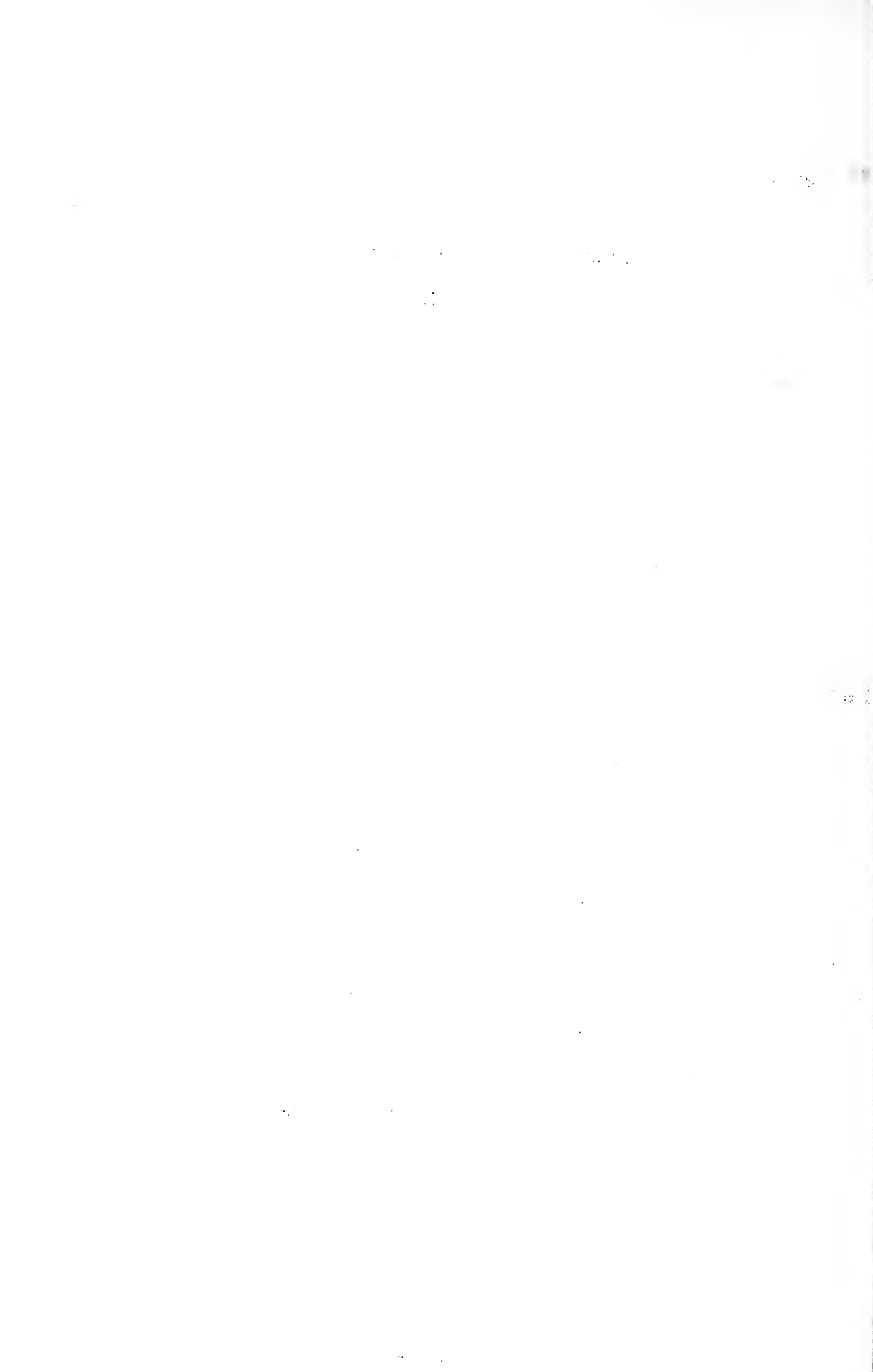
| | | | |
|---------------|---|------------|----|
| DL | = | 1267 | fk |
| LL-E60 | = | 1213 | |
| Impact | = | <u>425</u> | |
| Total | = | 2905 | |
| Sidewalk | = | 114 | |
| Design Moment | = | 3,282 | fk |

Member AB

| | | | |
|---------------|---|------------|----|
| DL | = | 3422 | fk |
| LL-E60 | = | 5005 | |
| Impact | = | <u>643</u> | |
| Total | = | 7070 | |
| LL-H15-S12-44 | = | 401 | |
| Conc. | = | 91 | |
| Impact | = | <u>68</u> | |
| Total | = | 560 | |
| Sidewalk | = | 239 | |
| Design Moment | = | 7,689 | fk |

Member BC

| | | | |
|---------------|---|------------|----|
| DL | = | 2326 | fk |
| LL-E60 | = | 2092 | |
| Impact | = | <u>481</u> | |
| Total | = | 4849 | |
| LL-H15-S12-44 | = | 272 | |
| Conc. | = | 75 | |
| Impact | = | <u>52</u> | |
| Total | = | 397 | |
| Sidewalk | = | 169 | |
| Design Moment | = | 5,465 | fk |



Member CD

| | | | |
|---------------|---|------------|----|
| DL | = | 1666 | fk |
| LL-E60 | = | 1551 | |
| Impact | = | <u>398</u> | |
| Total | = | 3615 | |
| LL-H15-H12-44 | = | 195 | |
| Conc. | = | 64 | |
| Impact | = | <u>44</u> | |
| Total | = | 303 | |
| Sidewalk | = | 125 | |
| Design Moment | = | 4,043 | fk |

Member DE

| | | | |
|---------------|---|------------|----|
| DL | = | 1192 | fk |
| LL-E60 | = | 1150 | |
| Impact | = | <u>345</u> | |
| Total | = | 2687 | |
| LL-H15-S12-44 | = | 140 | |
| Conc. | = | 56 | |
| Impact | = | <u>57</u> | |
| Total | = | 233 | |
| Sidewalk | = | 100 | |
| Design Moment | = | 3,020 | fk |

Influence Line Computations - Fourth Set

Load at B

Panel 1

$$-Q_A = \frac{(.0942 - 4)(.0866 \times 26.25 - .875 \times 30)}{2(2 - .0866)4} = 6.14$$

$$-Q_B = \frac{(.875 \times 30 - .0866 \times 26.25)}{2(2 - .0866)} = 6.28$$

$$Q_{R1} = \frac{(.875 \times 30 - .0866 \times 26.25)}{2(2 - .0866)4} = 1.57$$

Panel 2

$$-Q_B = \frac{(.0463 \times 1 - 4)(.0443 \times 22.5 + .125 \times 30)}{2(2 - .0443)4} = -1.20$$

$$-Q_C = \frac{(-.125 \times 30 - 22.5 \times .0443)}{2(2 - .0443)} = -1.21$$

$$Q_{R2} = \frac{(-.125 \times 30 - 22.5 \times .0443)}{2(2 - .0443)4} = -.30$$

Panel 3

$$-Q_C = \frac{(.0507 \times 2 - 3)(.0482 \times 18.75 + .125 \times 30)}{2(2 - .0482)3} = -1.16$$

$$-Q_D = \frac{(-.125 \times 30 - .0482 \times 18.75)}{2(2 - .0482)} = -1.19$$

$$Q_{R3} = \frac{(-.125 \times 30 - .0482 \times 18.75)}{2(2 - .0482)3} = -.40$$

Panel 4

$$-Q_D = \frac{-2(.125 \times 30)}{4 \times 2} = -.94$$

$$-Q_E = \frac{(-.125 \times 30)}{4} = -.94$$

$$Q_{R4} = \frac{(-.125 \times 30)}{4 \times 2} = -.47$$

1. The first part of the paper is devoted to a study of the properties of the function $f(x)$ defined by the equation

$$f(x) = \frac{1}{2} \left(f\left(\frac{x}{2}\right) + f\left(\frac{x+1}{2}\right) \right).$$

It is shown that the function $f(x)$ is continuous and that it satisfies the functional equation

$$f(x) = \frac{1}{2} \left(f\left(\frac{x}{2}\right) + f\left(\frac{x+1}{2}\right) \right).$$

It is also shown that the function $f(x)$ is periodic with period 1.

The second part of the paper is devoted to a study of the properties of the function $g(x)$ defined by the equation

$$g(x) = \frac{1}{2} \left(g\left(\frac{x}{2}\right) + g\left(\frac{x+1}{2}\right) \right).$$

It is shown that the function $g(x)$ is continuous and that it satisfies the functional equation

$$g(x) = \frac{1}{2} \left(g\left(\frac{x}{2}\right) + g\left(\frac{x+1}{2}\right) \right).$$

It is also shown that the function $g(x)$ is periodic with period 1.

The third part of the paper is devoted to a study of the properties of the function $h(x)$ defined by the equation

$$h(x) = \frac{1}{2} \left(h\left(\frac{x}{2}\right) + h\left(\frac{x+1}{2}\right) \right).$$

Panel 5

$$-Q_E = \frac{-0.125 \times 30}{4} = -0.94$$

$$-Q_T = \frac{-0.125 \times 30}{4} = -0.94$$

$$Q_{R5} = \frac{-0.125 \times 30}{4 \times 2} = -0.47$$

Panel 6

$$-Q_T = \frac{(-0.125 \times 30 + 0.0482 \times 30)}{2(2 - 0.0482)} = -0.82$$

$$-Q_G = \frac{(0.0507 \times 2 - 3)(-0.0482 \times 11.25 + 0.125 \times 30)}{2(2 - 0.0482)3} = -0.79$$

$$Q_{R6} = \frac{(-0.125 \times 30 + 0.0482 \times 11.25)}{2(2 - 0.0482)3} = -0.27$$

Panel 7

$$-Q_G = \frac{(-0.125 \times 30 + 0.0443 \times 7.5)}{2(2 - 0.0443)} = -0.87$$

$$-Q_H = \frac{(0.0463 \times 1 - 4)(-0.0443 \times 7.5 + 0.125 \times 30)}{2(2 - 0.0443)4} = -0.86$$

$$Q_{R7} = \frac{(-0.125 \times 30 + 0.0443 \times 7.5)}{2(2 - 0.0443)4} = -0.22$$

Panel 8

$$-Q_H = \frac{(-0.125 \times 30 + 0.0866 \times 3.75)}{2(2 - 0.0866)} = -0.90$$

$$-Q_I = \frac{(0.0942 \times 1 - 4)(-0.0866 \times 3.75 + 0.125 \times 30)}{2(2 - 0.0866)4} = -0.88$$

$$Q_{R8} = \frac{(-0.125 \times 30 + 0.0866 \times 3.75)}{2(2 - 0.0866)4} = -0.22$$

Handwritten text, mostly illegible due to extreme fading and bleed-through from the reverse side of the page. The text appears to be organized into several paragraphs or sections, with some lines being more distinct than others. Faint words and phrases are visible throughout the page.

Load at C

Panel 1

$$-Q_A = \frac{(.0942 \times 1 - 4)(.0866 \times 22.5 - .75 \times 30)}{2(2 - .0866)4} = 5.27$$

$$-Q_B = \frac{(.75 \times 30 - .0866 \times 22.5)}{2(2 - .0866)} = 5.38$$

$$Q_{R1} = \frac{(.75 \times 30 - .0866 \times 22.5)}{2(2 - .0866)4} = 1.35$$

Panel 2

$$-Q_B = \frac{(.0463 \times 1 - 4)(.0443 \times 45 - .75 \times 30)}{2(2 - .0443)4} = 5.17$$

$$-Q_C = \frac{(.75 \times 30 - .0443 \times 45)}{2(2 - .0443)} = 5.23$$

$$Q_{R2} = \frac{(.75 \times 30 - .0443 \times 45)}{2(2 - .0443)4} = 1.31$$

Panel 3

$$-Q_C = \frac{(.0507 \times 2 - 3)(.0482 \times 37.5 + .25 \times 30)}{2(2 - .0482)3} = -2.31$$

$$-Q_D = \frac{(-.25 \times 30 - .0482 \times 37.5)}{2(2 - .0482)} = -2.38$$

$$Q_{R3} = \frac{(-.25 \times 30 - .0482 \times 37.5)}{2(2 - .0482)3} = -.79$$

Panel 4

$$-Q_D = \frac{-2(.25 \times 30)}{4 \times 2} = -1.87$$

$$-Q_E = \frac{(-.25 \times 30)}{4} = -1.87$$

$$Q_{R4} = \frac{-.25 \times 30}{4 \times 2} = -.94$$

1. The first part of the paper is devoted to a general discussion of the problem.

2. The second part is devoted to a detailed study of the case of a single particle.

3. The third part is devoted to a study of the case of a system of particles.

4. The fourth part is devoted to a study of the case of a system of particles.

5. The fifth part is devoted to a study of the case of a system of particles.

6. The sixth part is devoted to a study of the case of a system of particles.

7. The seventh part is devoted to a study of the case of a system of particles.

8. The eighth part is devoted to a study of the case of a system of particles.

9. The ninth part is devoted to a study of the case of a system of particles.

10. The tenth part is devoted to a study of the case of a system of particles.

11. The eleventh part is devoted to a study of the case of a system of particles.

12. The twelfth part is devoted to a study of the case of a system of particles.

Panel 5

$$-Q_T = -1.88$$

$$-Q_F = -1.88$$

$$Q_{R5} = -0.94$$

Panel 6

$$-Q_T = -1.64$$

$$-Q_G = -1.58$$

$$Q_{R6} = -0.54$$

Panel 7

$$-Q_G = -1.74$$

$$-Q_H = -1.72$$

$$Q_{R7} = -0.44$$

Panel 8

$$-Q_H = -1.80$$

$$-Q_I = -1.76$$

$$Q_{R8} = -0.45$$

Load at D

Panel 1

$$-Q_A = \frac{(.0942 \times 1 - 4)(.0866 \times 18.75 - .625 \times 30)}{2(2 - .0866)4} = 4.38$$

$$-Q_B = \frac{(.625 \times 30 - .0866 \times 18.75)}{2(2 - .0866)} = 4.49$$

$$Q_{R1} = \frac{(.625 \times 30 - .0866 \times 18.75)}{2(2 - .0866)4} = 1.12$$

Panel 2

$$-Q_B = \frac{(.0463 \times 1 - 4)(.0443 \times 37.5 - .625 \times 30)}{2(2 - .0443)4} = 4.31$$

$$-Q_C = \frac{(.625 \times 30 - .0443 \times 37.5)}{2(2 - .0443)} = 4.36$$

$$Q_{R2} = \frac{(.625 \times 30 - .0443 \times 37.5)}{2(2 - .0443)4} = 1.09$$

Panel 3

$$-Q_C = \frac{(.0507 \times 2 - 3)(.0482 \times 56.25 - .625 \times 30)}{2(2 - .0482)3} = 3.98$$

$$-Q_D = \frac{(.625 \times 30 - .0482 \times 56.25)}{2(2 - .0482)} = 4.12$$

$$Q_{R3} = \frac{(.625 \times 30 - .0482 \times 56.25)}{2(2 - .0482)3} = 1.37$$

Panel 4

$$-Q_D = \frac{-2(.375 \times 30)}{4 \times 2} = -2.82$$

$$-Q_E = \frac{(-.375 \times 30)}{4} = -2.82$$

$$Q_{R4} = \frac{(-.375 \times 30)}{4 \times 2} = -1.41$$

Panel 5

$$-Q_E = -2.82$$

$$-Q_F = -2.82$$

$$Q_{R_5} = -1.41$$

Panel 6

$$-Q_E = -2.46$$

$$-Q_G = -2.37$$

$$Q_{R_6} = -0.81$$

Panel 7

$$-Q_G = -2.61$$

$$-Q_H = -2.58$$

$$Q_{R_7} = -0.66$$

Panel 8

$$-Q_H = -2.70$$

$$-Q_I = -2.64$$

$$Q_{R_8} = -0.67$$

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Load at E

Panel 1

$$-Q_A = \frac{(.0942 \times 1 - 4)(.0866 \times 15 - .5 \times 30)}{2(2 - .0866)4} = 3.51$$

$$-Q_B = \frac{(.5 \times 30 - .0866 \times 15)}{2(2 - .0866)} = 3.59$$

$$Q_{R_1} = \frac{(.5 \times 30 - .0866 \times 15)}{2(2 - .0866)4} = .90$$

Panel 2

$$-Q_B = \frac{(.0463 \times 1 - 4)(.0443 \times 30 - .5 \times 30)}{2(2 - .0443)4} = 3.44$$

$$-Q_C = \frac{(.5 \times 30 - .0443 \times 30)}{2(2 - .0443)} = 3.49$$

$$Q_{R_2} = \frac{(.5 \times 30 - .0443 \times 30)}{2(2 - .0443)4} = .87$$

Panel 3

$$-Q_C = \frac{(.0507 \times 2 - 3)(.0482 \times 45 - .5 \times 30)}{2(2 - .0482)3} = 3.18$$

$$-Q_D = \frac{(.5 \times 30 - .0482 \times 45)}{2(2 - .0482)} = 3.30$$

$$Q_{R_3} = \frac{(.5 \times 30 - .0482 \times 45)}{2(2 - .0482)3} = 1.10$$

Panel 4

$$-Q_D = \frac{-2(-.5 \times 30)}{4 \times 2} = 3.75$$

$$-Q_E = \frac{(.5 \times 30)}{4} = 3.75$$

$$Q_{R_4} = \frac{(.5 \times 30)}{4 \times 2} = 1.88$$

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8. The eighth part is devoted to a study of the case of a system of particles.

9. The ninth part is devoted to a study of the case of a system of particles.

10. The tenth part is devoted to a study of the case of a system of particles.

11. The eleventh part is devoted to a study of the case of a system of particles.

12. The twelfth part is devoted to a study of the case of a system of particles.

Panel 5

$$-Q_E = -3.76$$

$$-Q_F = -3.76$$

$$Q_{R_5} = -1.38$$

Panel 6

$$-Q_F = -3.28$$

$$-Q_G = -3.16$$

$$Q_{R_6} = -1.08$$

Panel 7

$$-Q_G = -3.48$$

$$-Q_H = -3.44$$

$$Q_{R_7} = -0.88$$

Panel 8

$$-Q_H = -3.60$$

$$-Q_I = -3.52$$

$$Q_{R_8} = -0.90$$

Determination of formulae for Panel Constant Computations

el 1

$$5 + 4 \div \left[\frac{(3 - .0866)(.0942 - 4)}{2(2 - .0866)} \right] A + \left[2 + \frac{(3 - .1732)(.0942 - 4)}{2(2 - .0866)} \right] B = -Q_A$$

$$2.52A - .90B = -Q_A$$

$$1.5 - \frac{(3 - .1732)4}{2(2 - .0866)} B + \left[2 - \frac{(3 - .0866)4}{2(2 - .0866)} \right] A = -Q_B$$

$$2.54B - 1.04A = -Q_B$$

el 2

$$5 + 4 \div \left[\frac{(3 - .0443)(.0463 - 4)}{2(2 - .0443)} \right] A + \left[2 + \frac{(3 - .0886)(.0463 - 4)}{2(2 - .0443)} \right] B = -Q_A$$

$$2.52A - .93B = -Q_A$$

$$3 - \frac{(3 - .0886)4}{2(2 - .0443)} B + \left[2 - \frac{(3 - .0443)4}{2(2 - .0443)} \right] A = -Q_B$$

$$4.03B - 1.02A = -Q_B$$

el 3

$$5x2 + 3 \div \left[\frac{(3 - .0482)(.0507x2 - 3)}{2(2 - .0482)} \right] A + \left[1.5 + \frac{(3 - .0946)(.0507x2 - 3)}{2(2 - .0482)} \right] B = -Q_A$$

$$3.31A - .65B = -Q_A$$

$$4.5 - \frac{(3 - .0946)3}{2(2 - .0482)} B + 1.5 - \frac{(3 - .0482)3}{2(2 - .0482)} A = -Q_B$$

$$5.26B - .77A = -Q_B$$

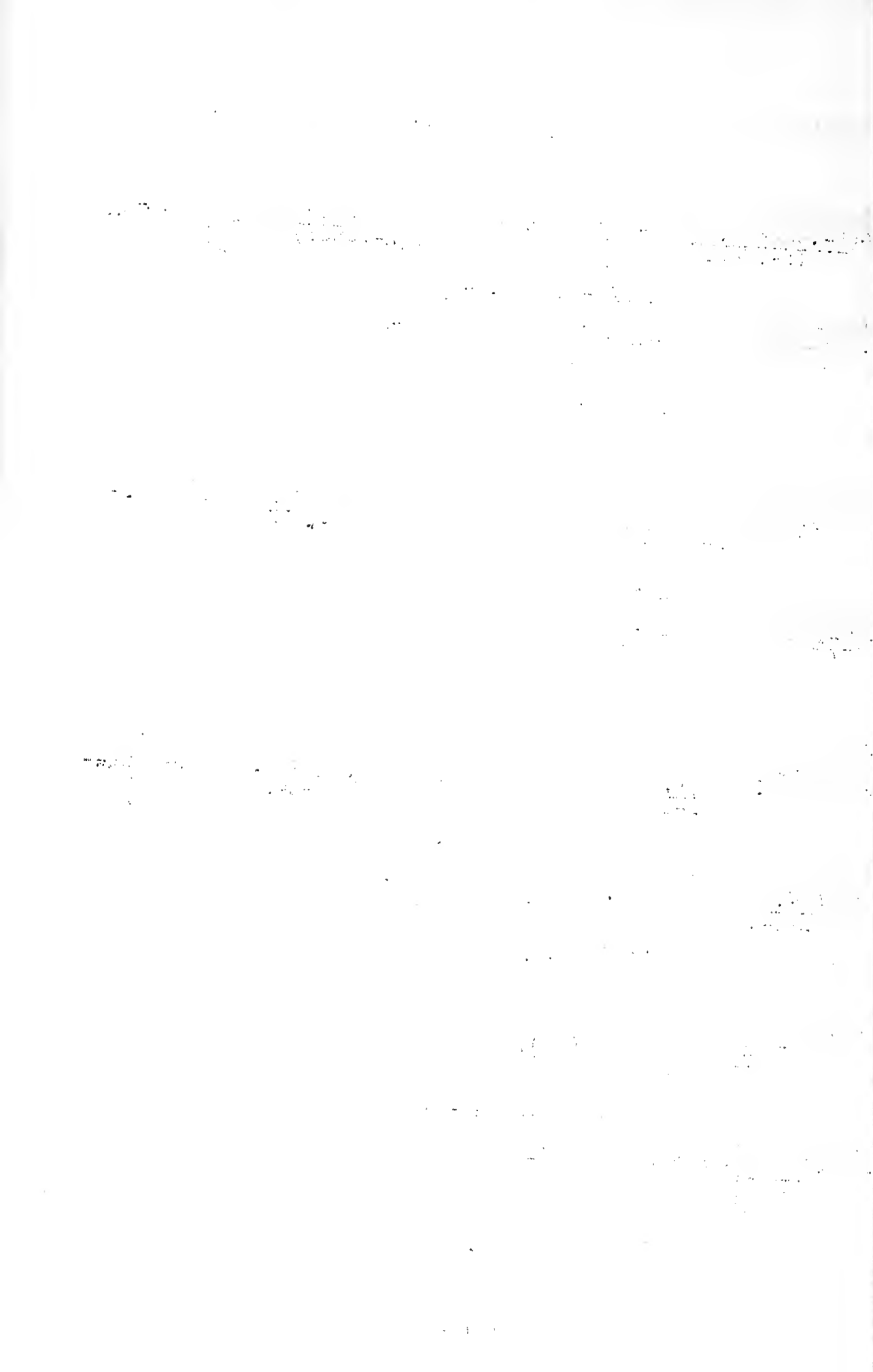
el 4

$$4.5 + 2 + \frac{3(-2)}{4} A + \left[1 + \frac{3(-2)}{4} \right] B = -Q_A$$

$$5.0A - .5B = -Q_A$$

$$2 + 6 - \frac{3(2)}{4} B + \left[1 - \frac{3(2)}{4} \right] A = -Q_B$$

$$6.5B - .5A = -Q_B$$



Panel 5

$$\left[1.5 \times 4 + \frac{2}{4} \right] E - \frac{2}{4} F = -Q_E$$

$$6.5E - 0.5F = -Q_E$$

$$\left[1.5 \times 3 + \frac{2}{4} \right] F - \frac{2}{4} E = -Q_F$$

$$5.0F - 0.5E = -Q_F$$

Panel 6

$$\left[3 + 1.5 \times 3 - \frac{(3-2 \times .0482)3}{2(2-.0482)} \right] F + \left[\frac{3}{2} - \frac{(3-.0482)(3)}{2(2-.0482)} \right] G = -Q_F$$

$$5.26F - 0.77G = -Q_F$$

$$2 + 3 + \frac{(3-.0482)(.0507 \times 2 - 3)}{2(2-.0482)} \left] G + \left[\frac{3}{2} + \frac{(3-2 \times .0482)(.0507 \times 2 - 3)}{2(2-.0482)} \right] F = -Q_G$$

$$3.81G - 0.65F = -Q_G$$

Panel 7

$$\left[4 + 1.5 \times 2 - \frac{(3-2 \times .0443)4}{2(2-.0443)} \right] G + \left[\frac{4}{2} - \frac{(3-.0443)4}{2(2-.0443)} \right] H = -Q_G$$

$$4.03G - 1.02H = -Q_G$$

$$1 + 4 + \frac{(3-.0443)(.0463 \times 1 - 4)}{2(2-.0443)} \left] H + \left[\frac{4}{2} + \frac{(3-2 \times .0443)(.0463 \times 1 - 4)}{2(2-.0443)} \right] G = -Q_H$$

$$2.52H - 0.93G = -Q_H$$

Panel 8

$$\left[4 + 1.5 \times 1 - \frac{(3-2 \times .0866)4}{2(2-.0866)} \right] F + \left[\frac{4}{2} - \frac{(3-.0866)4}{2(2-.0866)} \right] I = -Q_H$$

$$2.54H - 1.040 = -Q_H$$

$$.5 \times 1 + 4 + \frac{(3-.0866)(.0942 \times 1 - 4)}{2(2-.0866)} \left] I + \left[\frac{4}{2} - \frac{(3-2 \times .0866)(.0942 \times 1 - 4)}{2(2-.0866)} \right] H = -Q_I$$

$$2.52I - 0.90 = -Q_I$$

Joint Constant Computation - Load at B

Panel 1

$$2.52A - .90B = 6.14$$

$$-1.04A + 2.54B = 6.28$$

$$A = 3.89 \quad B = 4.07$$

$$R_1 = \frac{2.91 \times 3.89 + 2.83 \times 4.07}{3.89} + 1.57 = 7.45$$

$$M_{AB} = 4(3.89 + \frac{4.07}{2} - 7.45) = -6.12$$

$$M_{BA} = 4(4.07 + \frac{3.89}{2} - 7.45) = -5.80$$

Panel 2

$$2.52B - .93C = -1.20$$

$$-1.02B + 4.03C = -1.21$$

$$B = -.65 \quad C = -.46$$

$$R_2 = \frac{-2.96 \times .65 - 2.91 \times .46}{3.92} - .30 = -1.13$$

$$M_{BC} = 4(-.65 - \frac{.46}{2} + 1.13) = 1.00$$

$$M_{CB} = 4(-.46 - \frac{.65}{2} + 1.13) = 1.40$$

Panel 3

$$3.81C - .65D = -1.16$$

$$-.77C + 5.25D = -1.19$$

$$C = -.35 \quad D = -.28$$

$$R_3 = \frac{-2.95 \times .35 - 2.90 \times .28}{3.90} - .40 = -.87$$

$$M_{CD} = 3(-.35 - \frac{.28}{2} + .87) = 1.14$$

$$M_{DC} = 3(-.28 - \frac{.35}{2} + .87) = 1.26$$

Panel 4

$$5.0D - .5E = -.94$$

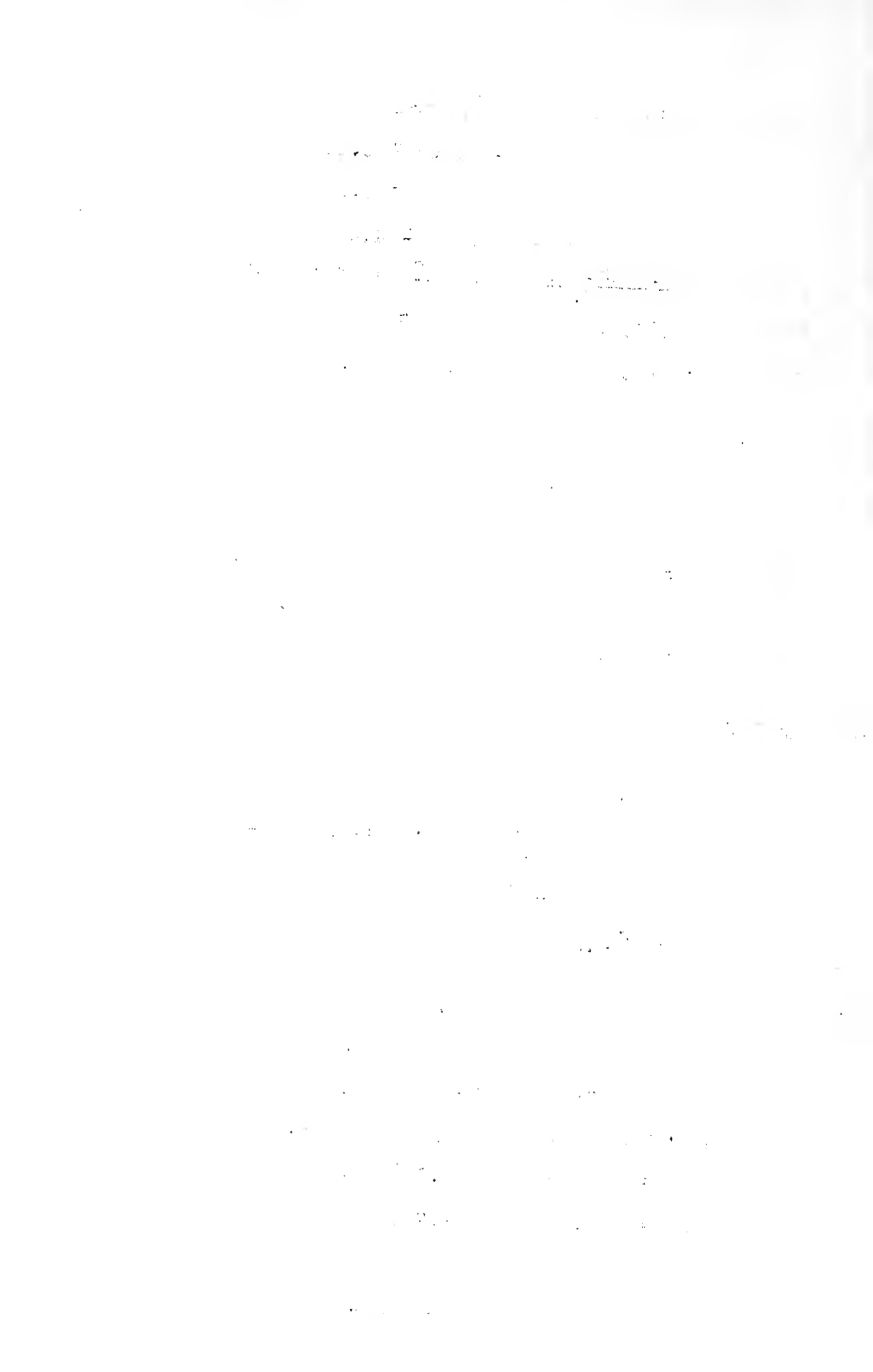
$$-.5D + 6.5E = -.94$$

$$D = -.20 \quad E = -.16$$

$$R_4 = 3/4(-.20 - .16) + .47 = -.74$$

$$M_{DE} = 2(-.20 - \frac{.16}{2} + .74) = .92$$

$$M_{ED} = 2(-.16 - \frac{.20}{2} + .74) = .96$$



anel 5

$$6.5E - 0.5F = -0.94$$

$$-0.5E + 5.0F = -0.94$$

$$E = -0.16$$

$$F = -0.20$$

$$R_5 = \frac{3}{4}(-.20 - .16) - 0.47 = -.74$$

$$M_{EF} = 2(-.16 - \frac{.20}{2} + .74) = .96$$

$$M_{FE} = 2(-.20 - \frac{.16}{2} + .74) = .92$$

anel 6

$$5.26F - 0.77G = -0.82$$

$$-0.65F + 3.81G = -0.79$$

$$F = -0.19 \quad G = -0.24$$

$$R_6 = \frac{-2.90 \times .19 - 2.95 \times .24}{3.90} - 0.27 = -0.59$$

$$M_{FG} = 3(-.19 - \frac{.24}{2} + .59) = .84$$

$$M_{GF} = 3(-.24 - .19 + .59) = .75$$

anel 7

$$4.03G - 1.02H = -0.87$$

$$-0.93G + 2.52H = -0.86$$

$$G = -0.33 \quad H = -0.46$$

$$R_7 = \frac{-2.91 \times .33 - 2.96 \times .46}{3.91} - 0.22 = -0.82$$

$$M_{GH} = 4(-.33 - \frac{.44}{2} + .82) = 1.04$$

$$M_{HG} = 4(-.46 - \frac{.33}{2} + .82) = .80$$

anel 8

$$2.54H - 1.04I = -0.90$$

$$-0.90H + 2.52I = -0.88$$

$$H = -0.58 \quad I = -0.56$$

$$R_8 = \frac{-2.83 \times 0.58 - 2.91 \times 0.56}{3.83} - .22 = -1.08$$

$$M_{HI} = 4(-.58 - \frac{.56}{2} + 1.08) = .88$$

$$M_{IH} = 4(-.56 - \frac{.58}{2} + 1.08) = .92$$

Load at C

Panel 1

$$\begin{aligned} 2.52A - .90B &= 5.27 \\ -1.04A + 2.54B &= 5.38 \end{aligned}$$

$$A = 3.33 \quad B = 3.48$$

$$R_1 = \frac{2.91 \times 3.33 + 2.83 \times 3.48}{3.82} + 1.35 = 6.47$$

$$M_{AB} = 4\left(3.33 + \frac{3.48}{2} - 6.47\right) = -5.88$$

$$M_{BA} = 4\left(3.48 + \frac{3.33}{2} - 6.47\right) = -5.32$$

Panel 2

$$\begin{aligned} 2.52B - .93C &= 5.17 \\ -1.02B + 4.03C &= 5.23 \end{aligned}$$

$$B = 2.79 \quad C = 2.0$$

$$R_2 = \frac{2.96 \times 2.79 + 2.91 \times 2.0}{3.92} + 1.31 = 4.90$$

$$M_{BC} = 4\left(2.79 + \frac{2.0}{2} - 4.90\right) = -4.44$$

$$M_{CB} = 4\left(2.0 + \frac{2.79}{2} - 4.90\right) = -6.04$$

Panel 3

$$\begin{aligned} 3.81C - .65D &= -2.31 \\ -.77C + 5.26D &= -2.33 \end{aligned}$$

$$C = -.70 \quad D = -.56$$

$$R_3 = \frac{-2.95 \times .70 - 2.90 \times .56}{3.90} - .79 = -1.74$$

$$M_{CD} = 3\left(-.70 - \frac{.56}{2} + 1.74\right) = 2.28$$

$$M_{DC} = 3\left(-.56 - \frac{.70}{2} + 1.74\right) = 2.49$$

Panel 4

$$5.0D - .5E = -1.87$$

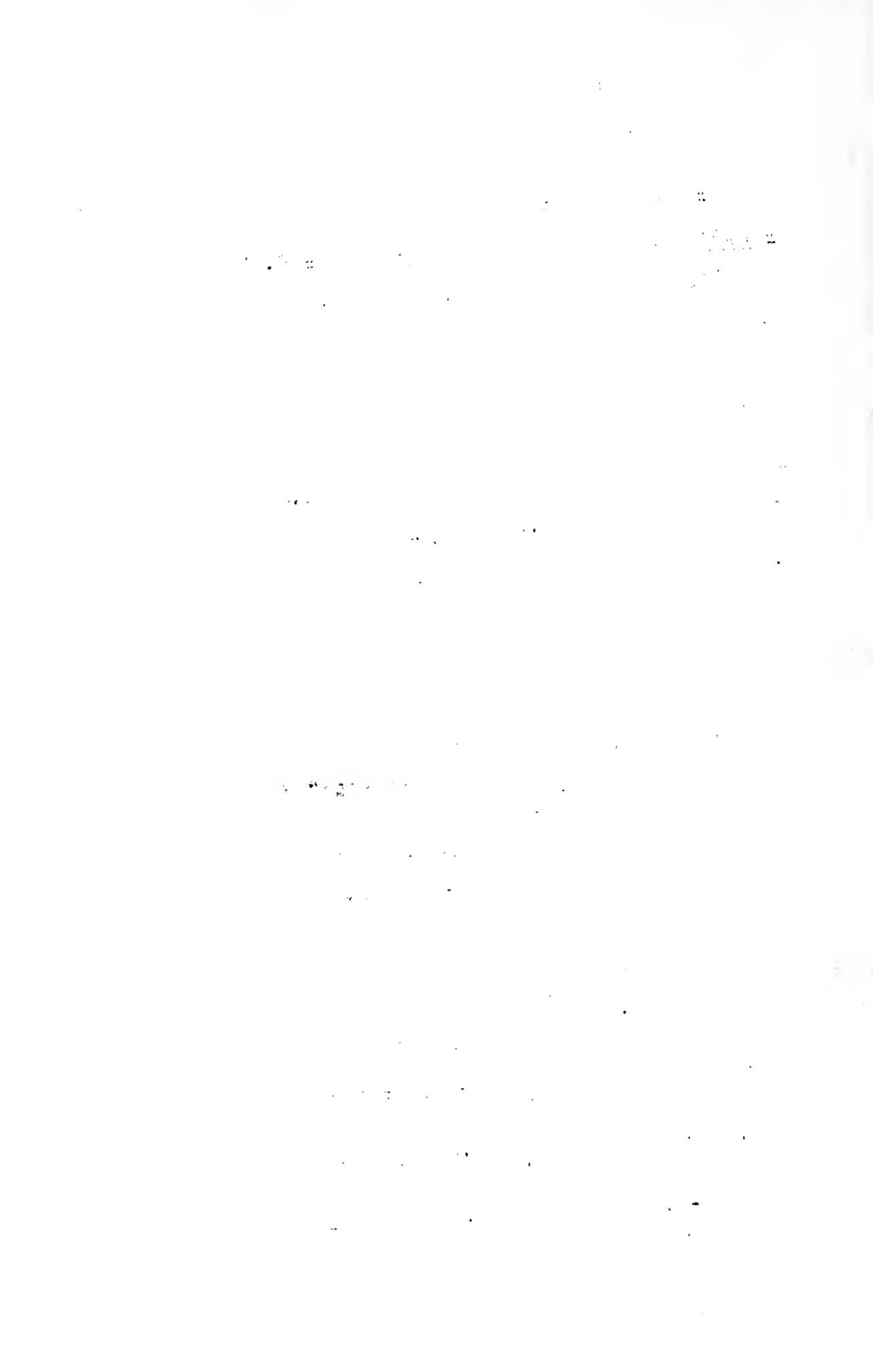
$$-.5D + 6.5E = -1.87$$

$$D = -.41 \quad E = -.32$$

$$R_4 = \frac{3}{4}(-.41 - .32) - .94 = -1.50$$

$$M_{DE} = 2\left(-.41 - \frac{.32}{2} + 1.50\right) = 1.86$$

$$M_{ED} = 2\left(-.32 - \frac{.41}{2} + 1.50\right) = 1.96$$



Panel 5

$$E = -0.32$$

$$F = -0.40$$

$$R_5 = -1.48$$

$$M_{EF} = 1.92$$

$$M_{FE} = 1.84$$

Panel 6

$$F = -0.73$$

$$G = -0.45$$

$$R_6 = -1.18$$

$$M_{FG} = 1.68$$

$$M_{GF} = 1.50$$

Panel 7

$$G = -0.86$$

$$H = -0.85$$

$$R_7 = -1.64$$

$$M_{GH} = 2.00$$

$$M_{HG} = 1.60$$

Panel 8

$$H = -1.16$$

$$I = -1.17$$

$$R_8 = -2.23$$

$$M_{HI} = 1.73$$

$$M_{IH} = 1.84$$

Load at D

$$\begin{aligned} 2.52A - .90B &= 4.38 \\ -1.04A + 2.54B &= 4.49 \end{aligned}$$

$$A = 2.79 \quad B = 2.91$$

$$R_1 = \frac{2.91 \times 2.79 + 2.83 \times 2.91}{3.82} - 1.12 = 5.40$$

$$M_{AB} = 4\left(2.79 + \frac{2.91}{2} - 5.40\right) = -4.64$$

$$M_{BA} = 4\left(2.91 + \frac{2.79}{2} - 5.40\right) = -4.40$$

Panel 2

$$\begin{aligned} 2.52B - .93C &= 4.31 \\ -1.02B + 4.03C &= 4.36 \end{aligned}$$

$$B = 2.33 \quad C = 1.66$$

$$R_2 = \frac{2.96 \times 2.33 + 2.91 \times 1.66}{3.92} - 1.09 = 4.09$$

$$M_{BC} = 4\left(2.33 + \frac{1.66}{2} - 4.09\right) = -3.72$$

$$M_{CB} = 4\left(1.66 + \frac{2.33}{2} - 4.09\right) = -5.08$$

Panel 3

$$\begin{aligned} 3.81C - .65D &= 3.98 \\ -.77C + 5.26D &= 4.12 \end{aligned}$$

$$C = 1.21 \quad D = .96$$

$$R_3 = \frac{2.95 \times 1.21 + 2.90 \times .96}{3.90} - 1.37 = 2.99$$

$$M_{CD} = 3\left(1.21 + \frac{.96}{2} - 2.99\right) = -3.90$$

$$M_{DC} = 3\left(.96 + \frac{1.21}{2} - 2.99\right) = -4.29$$

Panel 4

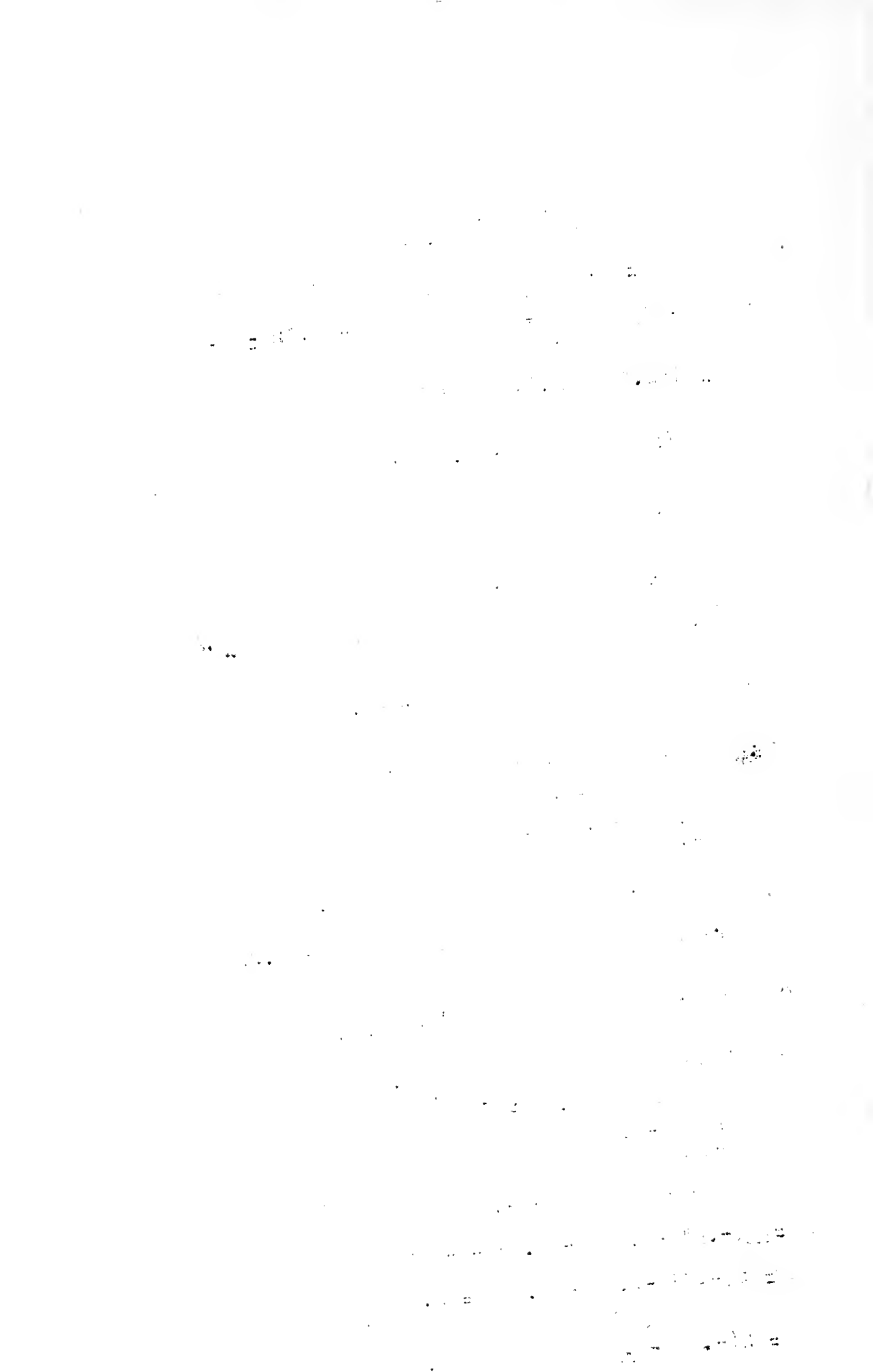
$$\begin{aligned} 5.0D - .5E &= -2.82 \\ -.5D + 6.5E &= -2.82 \end{aligned}$$

$$D = -.61 \quad E = -.48$$

$$R_4 = \frac{3(-.61 - .49)}{4} - 1.41 = -2.23$$

$$M_{DE} = 2\left(-.61 - \frac{.48}{2} + 2.23\right) = 2.76$$

$$M_{ED} = 2\left(-.48 - \frac{.61}{2} + 2.23\right) = 2.90$$



Panel 5

$$E = -0.48$$

$$F = -1.60$$

$$R_5 = -2.22$$

$$M_{EF} = 2.88$$

$$M_{FE} = 2.76$$

Panel 6

$$F = -0.57$$

$$G = -1.72$$

$$R_6 = -1.77$$

$$M_{FG} = 2.52$$

$$M_{GF} = 2.25$$

Panel 7

$$G = -0.99$$

$$H = -1.39$$

$$R_7 = -2.46$$

$$M_{GH} = 3.12$$

$$M_{HG} = 2.40$$

Panel 8

$$H = -1.74$$

$$I = -1.66$$

$$R_8 = -3.24$$

$$M_{HI} = 2.64$$

$$M_{IH} = 2.76$$

1. 1. 1.

2. 2. 2.

3. 3. 3.

4. 4. 4.

5. 5. 5.

6. 6. 6.

7. 7. 7.

8. 8. 8.

9. 9. 9.

10. 10. 10.

11. 11. 11.

12. 12. 12.

13. 13. 13.

14. 14. 14.

15. 15. 15.

16. 16. 16.

17. 17. 17.

18. 18. 18.

19. 19. 19.

20. 20. 20.

21. 21. 21.

22. 22. 22.

Load at E

Panel 1

$$2.52A - .91B = 3.51$$

$$-1.04A + 2.54B = 3.59$$

$$A = 2.22 \quad B = 2.33$$

$$R_1 = \frac{2.91 \times 2.22 + 2.83 \times 2.33}{3.82} + .90 = 4.32$$

$$M_{AB} = 4(2.22 + \frac{2.33}{2} - 4.32) = -3.76$$

$$M_{BA} = 4(2.33 + \frac{2.22}{2} - 4.32) = -3.52$$

Panel 2

$$2.52B - .93C = 3.44$$

$$-1.02B + 4.03C = 3.49$$

$$B = 1.86 \quad C = 1.33$$

$$R_2 = \frac{2.96 \times 1.86 + 2.91 \times 1.33}{3.92} + .87 = 3.26$$

$$M_{BC} = 4(1.86 + \frac{1.33}{2} - 3.26) = -2.96$$

$$M_{CB} = 4(2.33 + \frac{1.86}{2} - 3.26) = -4.00$$

Panel 3

$$3.81C - .65D = 3.18$$

$$-.77C + 5.26D = 3.30$$

$$C = .97 \quad D = .77$$

$$R_3 = \frac{2.95 \times .97 + 2.90 \times .77}{3.90} + 1.10 = 2.40$$

$$M_{CD} = 3(.97 + .77/2 - 2.40) = -3.15$$

$$M_{DC} = 3(.77 + .97/2 - 2.40) = -3.84$$

Panel 4

$$5.0D - .5E = 3.75$$

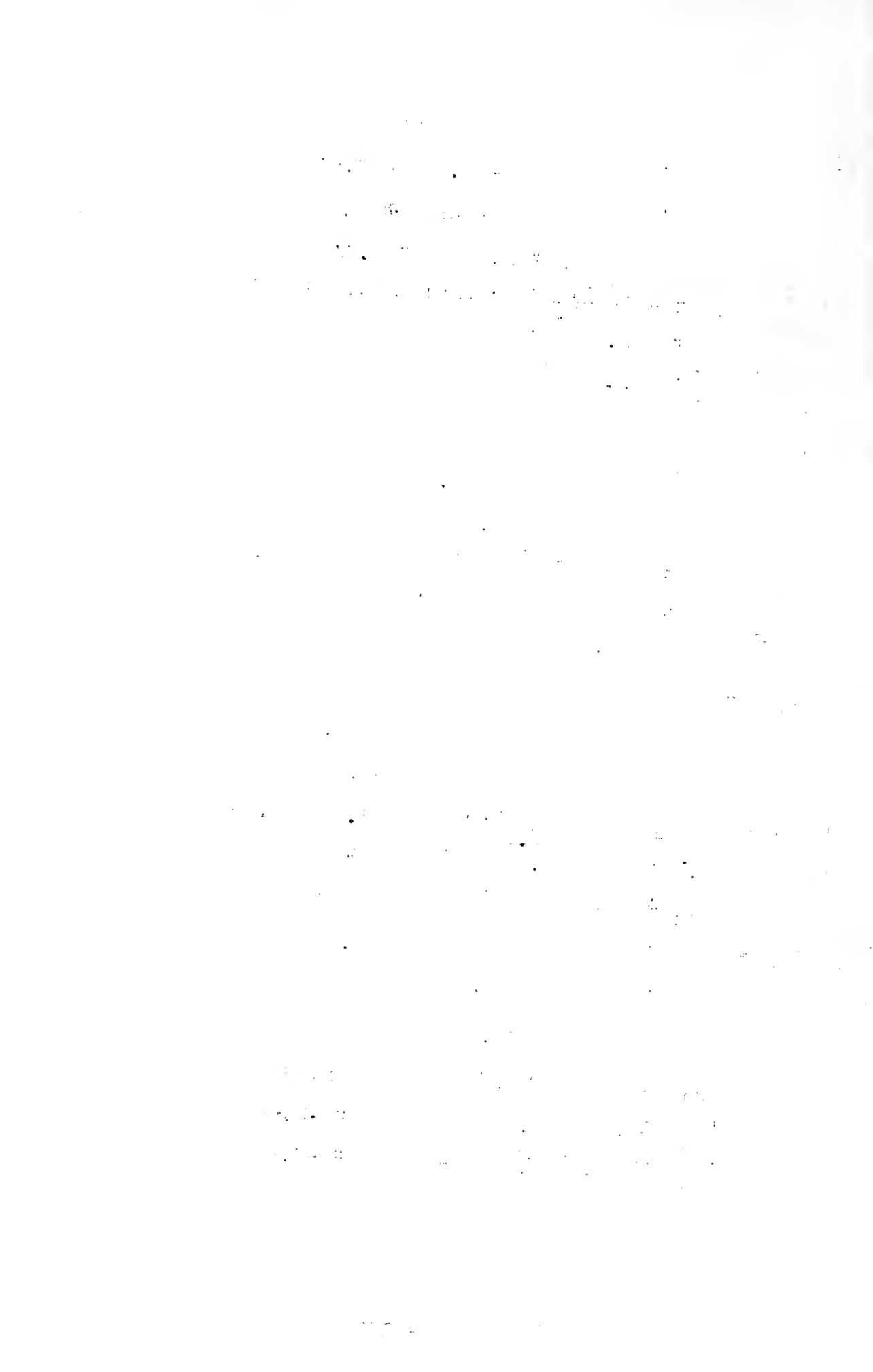
$$-.5D + 6.5E = 3.75$$

$$D = .82 \quad E = .64$$

$$R_4 = 3/4(.82 + .64) + 1.88 = 2.97$$

$$M_{DE} = 2(.82 + .64/2 - 2.97) = -3.66$$

$$M_{ED} = 2(.64 + .82/2 - 2.97) = -3.84$$



Panel 5

$$E = -0.64$$

$$F = -0.80$$

$$R_5 = -2.96$$

$$M_{EF} = 3.84$$

$$M_{FE} = 3.68$$

Panel 6

$$F = -0.76$$

$$G = -0.96$$

$$R_6 = -2.36$$

$$M_{FG} = 3.36$$

$$M_{GF} = 3.00$$

Panel 7

$$G = -1.32$$

$$H = -1.84$$

$$R_7 = -3.28$$

$$M_{GH} = 4.16$$

$$M_{HG} = 3.20$$

Panel 8

$$H = -2.32$$

$$I = -2.24$$

$$R_8 = -4.32$$

$$M_{HI} = 3.52$$

$$M_{IH} = 3.68$$

First Moment Corrections - Load at B

Panel 1

$$2.52A - .90B = 0$$

$$-1.04A + 2.54B = -1.00$$

$$A = -.16 \quad B = -.46$$

$$R_1 = \frac{-2.91 \times .16 - 2.83 \times .46}{3.83} = -0.46$$

$$M_{AB} = 4(-.16 - .46/2 + .46) = .28$$

$$M_{BA} = 4(-.46 - .16/2 + .46) = -.32$$

Panel 2

$$2.52B - .93C = 5.80$$

$$-1.02B + 4.03C = -1.14$$

$$B = 2.42 \quad C = .33$$

$$R_2 = \frac{2.90 \times 2.42 + 2.91 \times .33}{3.81} = 2.07$$

$$M_{BC} = 4(2.42 + .33/2 - 2.07) = 2.04$$

$$M_{CB} = 4(.33 + 2.42/2 - 2.07) = -2.16$$

Panel 3

$$3.81C - .65D = -1.40$$

$$-.77C + 5.26D = -.92$$

$$C = -.40 \quad D = -.23$$

$$R_3 = \frac{-2.95 \times .40 - 2.90 \times .23}{3.90} = -.47$$

$$M_{CD} = 3(-.40 - .23/2 + .47) = -.12$$

$$M_{DC} = 3(-.23 - .40/2 + .47) = .12$$

Panel 4

$$6.5D - 0.5E = -1.26$$

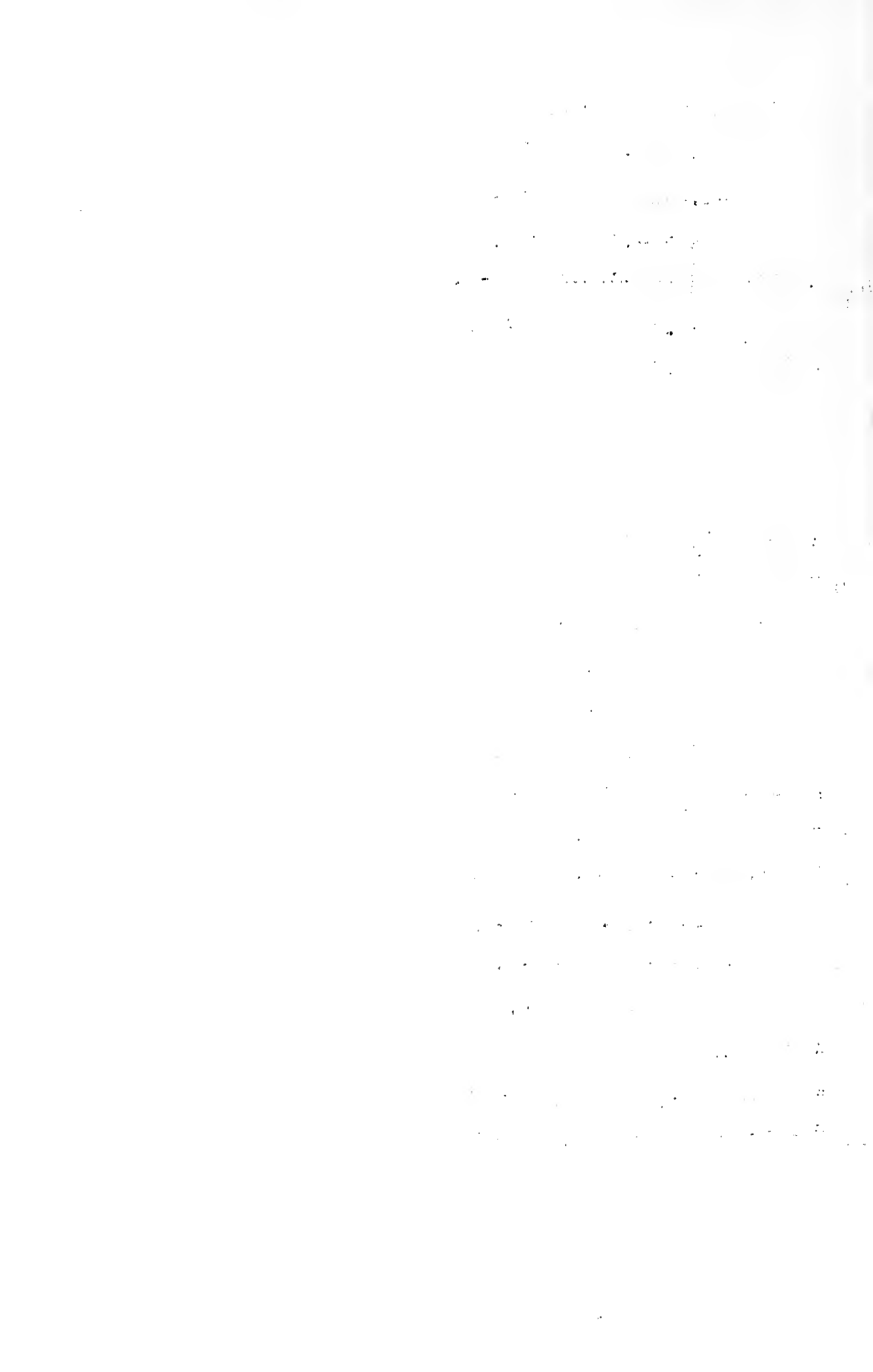
$$-0.5D + 5.0E = -.96$$

$$D = -.22 \quad E = -.21$$

$$R_4 = 3/4(-.22 - .21) = -.32$$

$$M_{DE} = 2(-.22 - .21/2 + .32) = 0$$

$$M_{ED} = 2(-.21 - .22/2 + .32) = 0$$



Panel 5

$$5.0E - 0.5F = -.96$$

$$-0.5 + 6.5F = -.84$$

$$E = -.21, F = -.14$$

$$R_5 = \frac{3}{4} (-.21 - .14) = -.26$$

$$M_{EF} = 2(-.21 - \frac{.14}{2} + .26) = -.04$$

$$M_{FE} = 2(-.14 - \frac{.21}{2} + .26) = .04$$

Panel 6

$$5.26F + 0.77G = -.92$$

$$-0.65F + 3.81G = -1.04$$

$$F = -.22, G = -.31$$

$$R_6 = \frac{-2.90 \times .22 - 2.95 \times .31}{3.90} = .40$$

$$M_{FG} = 3(-.22 - \frac{.31}{2} + .40) = .06$$

$$M_{GF} = 3(-.31 - \frac{.22}{2} + .40) = -.06$$

Panel 7

$$4.03G - 1.02H = -.75$$

$$-0.93G + 2.52H = -.88$$

$$G = -.30, H = -.46$$

$$R_7 = \frac{-2.91 \times .30 - 2.96 \times .46}{3.91} = -.57$$

$$M_{GH} = 4(-.30 - \frac{.46}{2} + .57) = .16$$

$$M_{HG} = 4(-.46 - \frac{.30}{2} + .57) = -.16$$

Panel 8

$$2.54H - 1.04I = -.80$$

$$-0.94H + 2.52I = 0$$

$$H = -.37, I = -.13$$

$$R_8 = \frac{-2.33 \times .37 - 2.91 \times .13}{3.83} = -.37$$

$$M_{HI} = 4(-.37 - \frac{.13}{2} + .37) = -.24$$

$$M_{IH} = 4(-.13 - \frac{.37}{2} + .37) = .24$$

Second Moment Corrections-Load at B

Panel 1

$$2.52A - .90B = 0$$

$$-1.04A + 2.54B = -2.04$$

$$A = -.34, B = -.94$$

$$R_1 = \frac{-2.91 \times .34 - 2.83 \times .94}{3.83} = -.95$$

$$M_{AB} = 4(-.34 - \frac{.94}{2} + .95) = .56$$

$$M_{BA} = 4(-.94 - \frac{.34}{2} + .95) = -.64$$

Panel 3

$$3.81C - .65D = -2.18$$

$$-.77C + 5.26D = 0$$

$$C = -.58, D = -.08$$

$$R_3 = \frac{-2.95 \times .58 - 2.90 \times .08}{3.90} = -.50$$

$$M_{CD} = 3(-.58 - \frac{.08}{2} + .50) = -.36$$

$$M_{DC} = 3(-.08 - \frac{.58}{2} + .50) = .39$$

8

1000 1000 1000

1000 1000 1000 1000

1000 1000 1000

1000 1000 1000 1000

1000 1000 1000

1000

1000

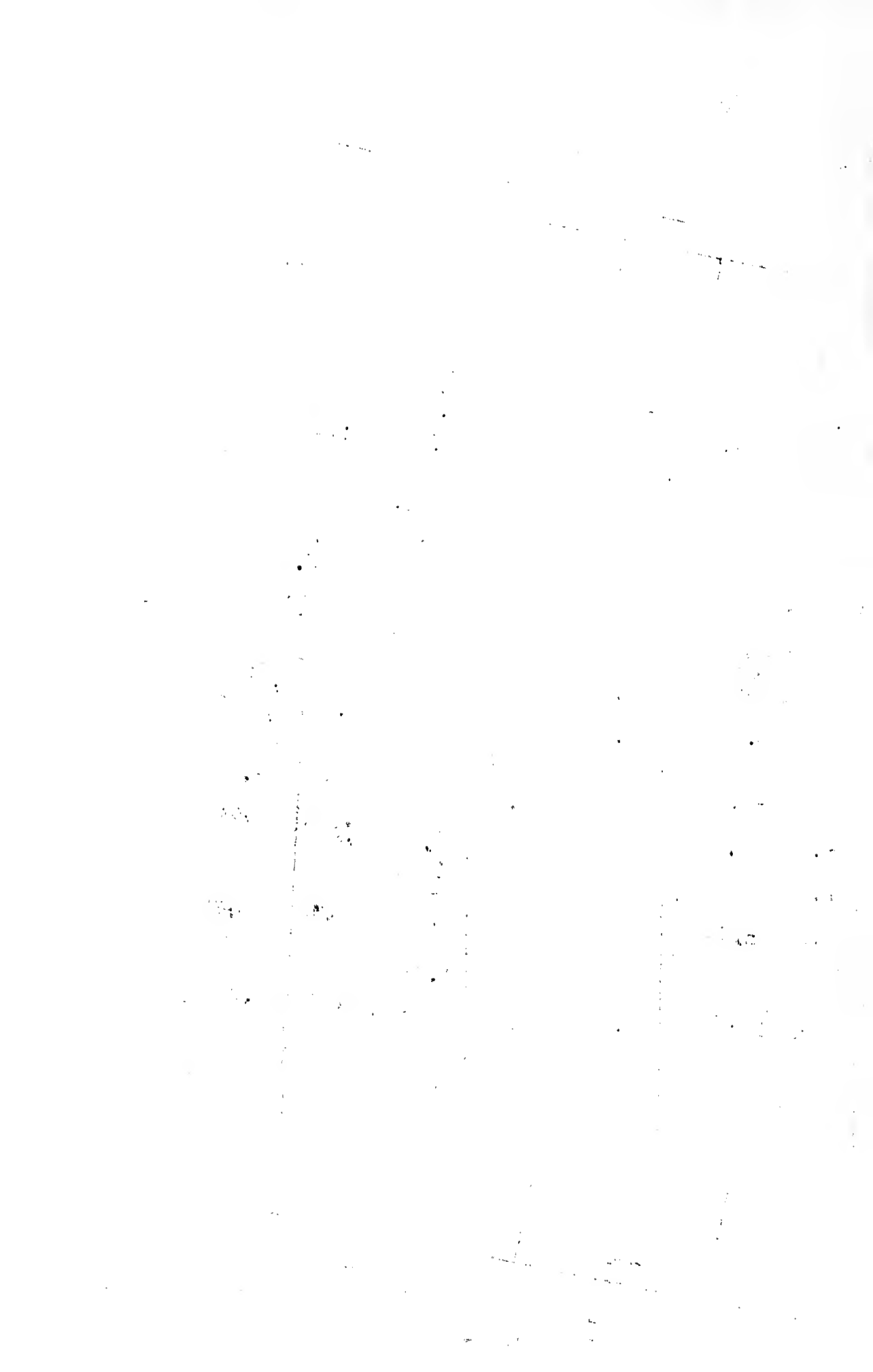
1000 1000

1000 1000 1000 1000

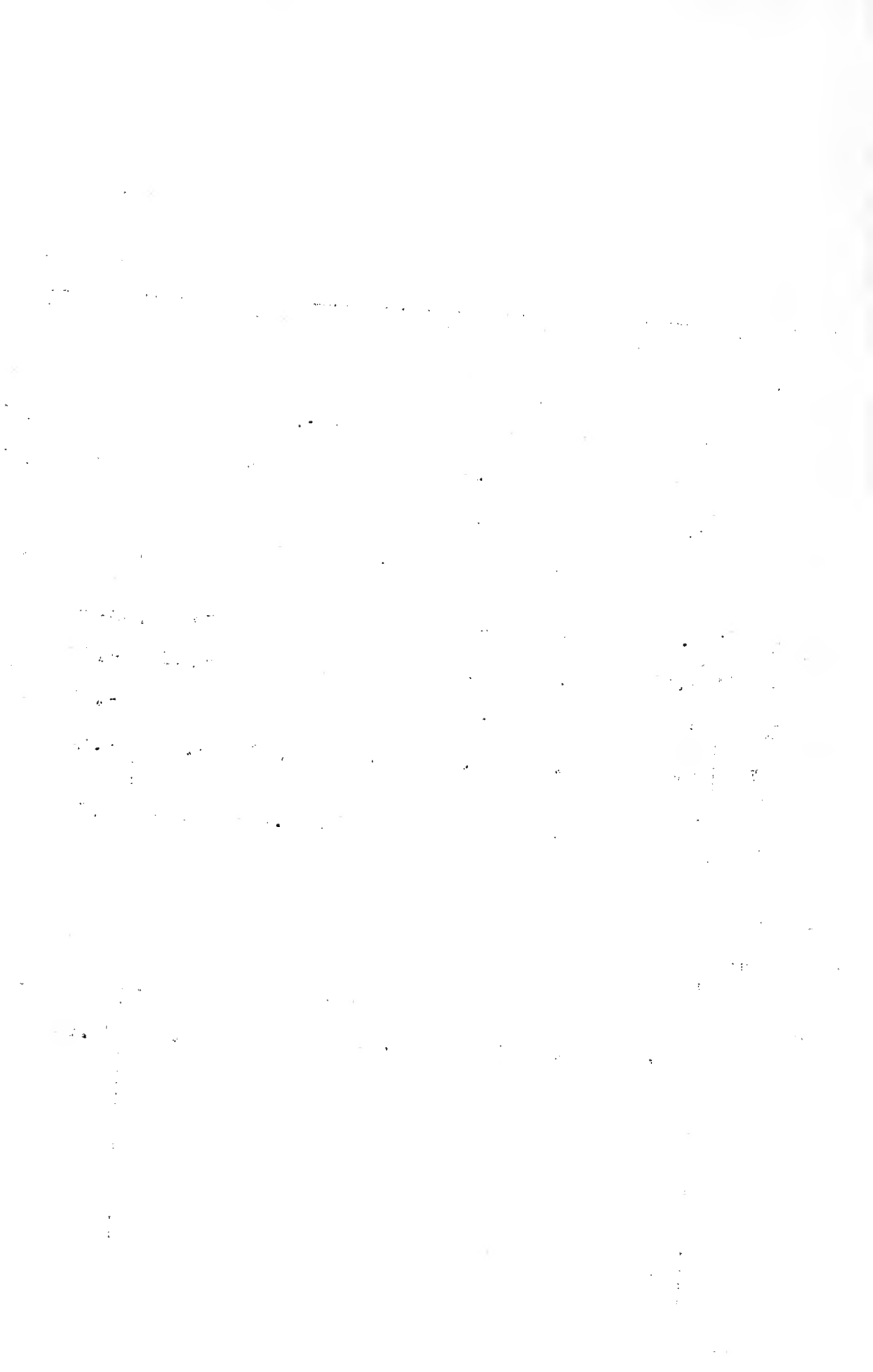
1000 1000

Load at B

| Panel
Point | 1 | | 2 | | 3 | | 4 | |
|----------------|-------|-------|-------|-------|-------|-------|-------|------|
| | A | B | B | C | C | D | D | E |
| Q | 6.14 | 6.28 | -1.20 | -1.21 | -1.16 | -1.19 | -.94 | -.94 |
| C | 3.89 | 4.07 | -.65 | -.46 | -.35 | -.28 | -.20 | -.16 |
| R | 7.45 | | -1.13 | | -.87 | | -.74 | |
| E' | -6.12 | -5.80 | 1.00 | 1.40 | 1.14 | 1.26 | .92 | .96 |
| Q | 0 | -1.00 | 5.80 | -1.14 | -1.40 | -.92 | -1.26 | -.98 |
| C | -.16 | -.46 | 2.42 | .32 | -.40 | -.23 | -.22 | -.21 |
| R | -.46 | | 2.07 | | -.47 | | -.32 | |
| E'' | .28 | -.32 | 2.04 | -2.16 | -.12 | .12 | 0 | 0 |
| Q | 0 | -2.04 | .32 | .12 | -2.16 | 0 | -.12 | .04 |
| C | -.34 | -.94 | | | -.58 | -.08 | | |
| R | -.95 | | | | -.50 | | | |
| E''' | .56 | -.64 | 0 | 0 | -.36 | .39 | .0 | .00 |
| E | -5.28 | -6.76 | 3.04 | -0.76 | .66 | 1.77 | .92 | .96 |



| Panel
Point | 5 | | 6 | | 7 | | 8 | |
|----------------|------|------|------|-------|------|------|-------|------|
| | E | F | F | G | G | H | H | I |
| Q | -.94 | -.94 | -.82 | -.79 | -.87 | -.86 | -.90 | -.88 |
| C | -.16 | -.20 | -.19 | -.24 | -.33 | -.46 | -.58 | -.56 |
| R | -.74 | | -.59 | | -.82 | | -1.08 | |
| H' | .96 | .92 | .34 | .75 | 1.04 | .80 | .88 | .92 |
| Q | -.96 | -.84 | -.92 | -1.04 | -.75 | -.88 | -.80 | 0 |
| C | -.21 | -.14 | -.22 | -.31 | -.50 | -.46 | -.37 | -.13 |
| R | -.26 | | -.40 | | -.57 | | -.37 | |
| H'' | -.04 | -.04 | .06 | -.06 | .16 | -.16 | -.24 | .24 |
| Q | 0 | -.06 | -.04 | .16 | .06 | .24 | .16 | 0 |
| C | | | | | | | | |
| R | | | | | | | | |
| H''' | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | | | |
| H | .92 | .96 | .90 | .69 | 1.20 | .64 | .64 | 1.16 |
| | | | | | | | | |
| | | | | | | | | |



First Moment Corrections - Load at C

Panel 1

$$2.52A - .95B = 0$$

$$-1.04A + 2.54B = 4.44$$

$$A = .73 \quad B = 2.05$$

$$R_1 = \frac{2.91 \times .73 + 2.83 \times 2.05}{3.63} = 2.06$$

$$M_{AB} = 4(.73 + 2.05/2 - 2.06) = -1.24$$

$$M_{BA} = 4(2.05 + .73/2 - 2.06) = 1.40$$

Panel 2

$$2.52B - .93C = 5.32$$

$$-1.02B + 4.03C = -2.28$$

$$B = 2.10 \quad C = -.04$$

$$R_2 = \frac{2.93 \times 2.10 + 2.91 \times .04}{3.91} = 1.60$$

$$M_{BC} = 4(2.10 + .04/2 - 1.60) = 1.92$$

$$M_{CB} = 4(-.04 + 2.10/2 - 1.60) = -2.04$$

Panel 3

$$3.81C - 0.65D = 6.04$$

$$-0.77C + 5.26D = -1.86$$

$$C = 1.56 \quad D = -.12$$

$$R_3 = \frac{2.95 \times 1.56 + 2.90 \times .12}{3.90} = 1.09$$

$$M_{CD} = 3(1.56 + .12/2 - 1.09) = 1.23$$

$$M_{DC} = 3(-.12 + 1.56/2 - 1.09) = -1.29$$

Panel 4

$$6.5D - 0.5E = -2.49$$

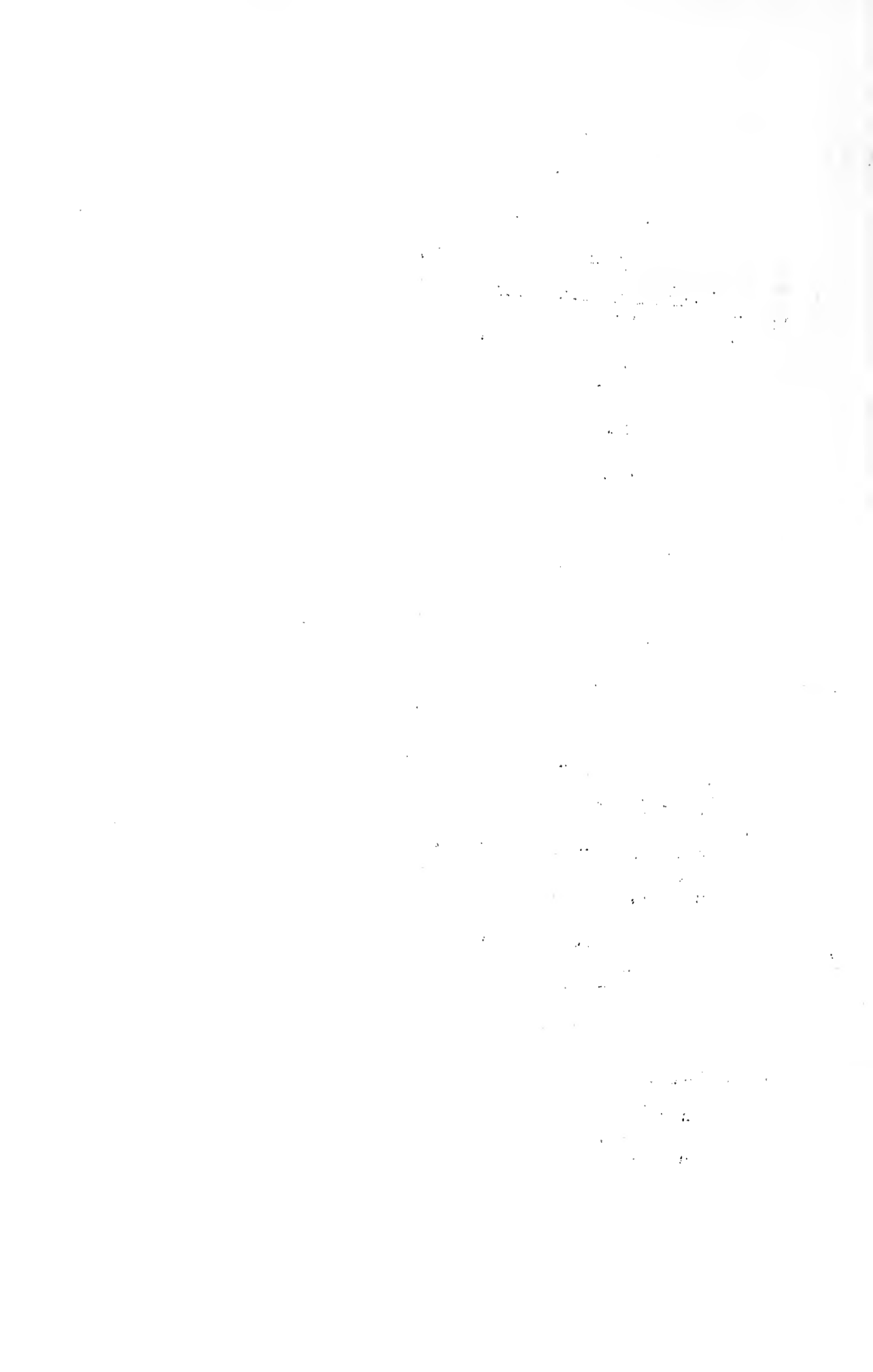
$$-0.5D + 5.0E = -1.92$$

$$D = -.42 \quad E = -.42$$

$$R_4 = 3/4(-.42 - .42) = -.63$$

$$M_{DE} = 2(-.42 + .42/2 + .63) = 0$$

$$M_{ED} = 2(-.42 - .42/2 + .63) = 0$$



Panel 5 $5.0E - 0.5F = -1.96$

$$-0.5E + 6.5F = -1.63$$

$$E = -.42 \quad F = -.29$$

$$R_5 = 3/4(-.42 - .29) = -.53$$

$$N_{EF} = 2(-.42 - .29/2 + .53) = -.06$$

$$N_{FE} = 2(-.29 - .42/2 + .53) = .06$$

Panel 6 $5.26F - 0.77G = -1.84$

$$-0.65F + 3.81G = -2.08$$

$$F = -.44 \quad G = -.62$$

$$R_6 = \frac{-2.90 \times .44 - 2.95 \times .62}{3.96} = -.80$$

$$N_{FG} = 3(-.44 - .62/2 + .80) = .15$$

$$N_{GF} = 3(-.29 - .44/2 + .80) = -.12$$

Panel 7 $4.03G - 1.02H = -1.50$

$$-0.93G + 2.52H = -1.76$$

$$G = -.60 \quad H = -.92$$

$$R_7 = \frac{-2.91 \times .60 - 2.96 \times .92}{3.91} = -1.14$$

$$N_{GH} = 4(-.60 - .92/2 + 1.14) = .32$$

$$N_{HG} = 4(-.92 - .60/2 + 1.14) = -.32$$

Panel 8 $2.54H - 1.04I = -1.60$

$$-0.90H + 2.52I = 0$$

$$H = -.74 \quad I = -.26$$

$$R_8 = \frac{-2.83 \times .74 - 2.91 \times .26}{3.83} = -.74$$

$$N_{HI} = 4(-.74 - .26/2 + .74) = -.52$$

$$N_{IH} = 4(-.26 - .74/2 + .74) = .44$$

1. *Journal of the American Medical Association*, 1997; 277: 1033-1038.

1. *Chlorophyll a* and *Chlorophyll b* were determined by the method of Arar and Collins (1971) using a Shimadzu 1010 spectrophotometer. The concentration of chlorophyll was expressed in $\mu\text{g mL}^{-1}$ of the sample.

^a $P < .05$.

1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 26

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1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

Figure 1. The effect of the concentration of the *Agrobacterium* suspension on the transformation efficiency of *Agrobacterium* strains. The *Agrobacterium* strains were grown in the YEA medium for 24 h at 28 °C. The cell concentration of the strains was adjusted to 1.0 × 10⁸ cells/ml. The cell suspension was mixed with the plant tissue and the transformation efficiency was determined. The results were expressed as the mean ± SD of three independent experiments. The asterisk indicates a significant difference (*p* < 0.05) between the strains.

Second Moment Corrections - Load at C

Panel 1

$$2.52A - 0.90B = 0$$

$$-1.04A + 2.54B = -1.92$$

$$A = -.32 \quad B = -.88$$

$$R_1 = \frac{-2.91 \times .32 - 2.83 \times .88}{3.83} = -.89$$

$$M_{AB} = 4(-.32 - .88/2 + .89) = .52$$

$$M_{BA} = 4(-.88 - .32/2 + .89) = -.60$$

Panel 2

$$2.52B - 0.93C = -1.40$$

$$-1.02B + 4.03C = -1.23$$

$$B = -.74 \quad C = -.49$$

$$R_2 = \frac{-2.96 \times .74 - 2.91 \times .49}{3.91} = -.93$$

$$M_{BC} = 4(-.74 - .49/2 + .93) = -.24$$

$$M_{CB} = 4(-.49 - .74/2 + .93) = .28$$

Panel 3

$$3.81C - 0.65D = 2.04$$

$$-0.77C + 5.26D = 0$$

$$C = .55 \quad D = .08$$

$$R_3 = \frac{2.95 \times .55 + 2.90 \times .08}{3.90} = .47$$

$$M_{CD} = 3(.55 + .08/2 - .47) = .36$$

$$M_{DC} = 3(.08 + .55/2 - .47) = -.36$$

Panel 4

$$6.5D - 0.5E = 1.29$$

$$-0.5D + 5.0E = .06$$

$$D = .20 \quad E = .03$$

$$R_4 = 3/4(.20 + .03) = .17$$

$$M_{DE} = 2(.20 + .03/2 - .17) = .08$$

$$M_{ED} = 2(.03 + .20/2 - .17) = -.08$$

The first of these is the fact that the majority of the population of the world is now living in urban areas. This is a result of the process of urbanization, which has been going on since the beginning of the industrial revolution. The second is the fact that the majority of the population of the world is now living in the developing countries. This is a result of the process of population growth, which has been going on since the beginning of the industrial revolution. The third is the fact that the majority of the population of the world is now living in the Third World. This is a result of the process of decolonization, which has been going on since the beginning of the industrial revolution.

The fourth is the fact that the majority of the population of the world is now living in the industrialized countries. This is a result of the process of industrialization, which has been going on since the beginning of the industrial revolution. The fifth is the fact that the majority of the population of the world is now living in the developed countries. This is a result of the process of development, which has been going on since the beginning of the industrial revolution. The sixth is the fact that the majority of the population of the world is now living in the advanced countries. This is a result of the process of advancement, which has been going on since the beginning of the industrial revolution.

The seventh is the fact that the majority of the population of the world is now living in the modern countries. This is a result of the process of modernization, which has been going on since the beginning of the industrial revolution. The eighth is the fact that the majority of the population of the world is now living in the contemporary countries. This is a result of the process of contemporaryization, which has been going on since the beginning of the industrial revolution. The ninth is the fact that the majority of the population of the world is now living in the current countries. This is a result of the process of currentization, which has been going on since the beginning of the industrial revolution.

The tenth is the fact that the majority of the population of the world is now living in the present countries. This is a result of the process of presentization, which has been going on since the beginning of the industrial revolution. The eleventh is the fact that the majority of the population of the world is now living in the future countries. This is a result of the process of futurization, which has been going on since the beginning of the industrial revolution. The twelfth is the fact that the majority of the population of the world is now living in the past countries. This is a result of the process of pastization, which has been going on since the beginning of the industrial revolution.

The thirteenth is the fact that the majority of the population of the world is now living in the present countries. This is a result of the process of presentization, which has been going on since the beginning of the industrial revolution. The fourteenth is the fact that the majority of the population of the world is now living in the future countries. This is a result of the process of futurization, which has been going on since the beginning of the industrial revolution.

nel 5

$$5.0E - 0.5F = 0$$

$$-0.5E + 6.5F = -.15$$

$$E = 0 \quad F = -.02$$

$$R_5 = 3/4(-.02) = -.02$$

$$M_{EF} = 0$$

$$M_{FE} = 0$$

nel 6

$$5.26F - 0.77G = -.06$$

$$-0.65F + 3.81G = -.32$$

$$F = -.02 \quad G = -.08$$

$$R_6 = \frac{-2.90 \times .02 - 2.95 \times .08}{3.90} = -.07$$

$$M_{FG} = 3(-.02 - .08/2 + .07) = .03$$

$$M_{GF} = 3(-.08 - .02/2 + .07) = -.06$$

nel 7

$$4.03G - 1.02H = .12$$

$$-0.93G + 2.52H = .52$$

$$G = .09 \quad H = .24$$

$$R_7 = \frac{2.91 \times .09 + 2.96 \times .24}{3.91} = .25$$

$$M_{GH} = 4(.09 + .24/2 - .25) = -.16$$

$$M_{HG} = 4(.24 + .09/2 - .25) = .16$$

nel 8

$$2.54H - 1.04I = .32$$

$$-0.90H - 2.52I = 0$$

$$H = .15 \quad I = .05$$

$$R_8 = \frac{2.83 \times .15 + 2.91 \times .05}{3.83} = .15$$

$$M_{HI} = 4(.15 + .05/2 - .15) = .10$$

$$M_{IH} = 4(.05 + .15/2 - .15) = -.10$$

Load at C

| Panel | 1 | | 2 | | 3 | | 4 | |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|
| Joint | A | B | B | C | C | D | D | E |
| Q | 5.27 | 5.33 | 5.17 | 5.23 | -2.31 | -2.38 | -1.87 | -1.87 |
| α | 3.33 | 3.48 | 2.79 | 2.00 | - .70 | - .56 | - .41 | - .32 |
| R | 6.47 | | 4.90 | | -1.74 | | -1.50 | |
| M | -5.88 | -5.32 | -4.44 | -6.04 | 2.28 | 2.49 | 1.86 | 1.96 |
| Q | 0 | 4.44 | 5.32 | -2.28 | 6.04 | -1.86 | -2.49 | -1.92 |
| α | .73 | 2.05 | 2.10 | - .04 | 1.56 | - .12 | - .42 | - .42 |
| R | 2.06 | | 1.60 | | 1.09 | | - .63 | |
| M' | -1.24 | 1.40 | 1.92 | -2.04 | 1.23 | -1.29 | 0 | 0 |
| Q | 0 | -1.92 | -1.40 | -1.23 | 2.04 | 0 | 1.29 | .06 |
| | - .32 | - .88 | - .74 | - .49 | .55 | .08 | .20 | .03 |
| R | - .89 | | - .93 | | .47 | | .17 | |
| M'' | .52 | - .60 | - .24 | .28 | .36 | - .36 | .08 | - .08 |
| H | -6.60 | -4.52 | -3.76 | -7.80 | 3.87 | .84 | 1.94 | 1.88 |

1. The first part of the paper discusses the importance of the study of the history of the United States. It is argued that a knowledge of the past is essential for a full understanding of the present and for the development of a sound policy for the future. The author points out that the study of history is not only a means of satisfying a natural curiosity about the past, but also a means of developing a sense of responsibility for the future. He concludes that the study of history is a necessary part of a liberal education and that it should be made a compulsory part of the curriculum of all schools and colleges.

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|------|-------|-------|-------|-------|-------|-------|-------|
| E | F | F | G | G | H | H | I |
| 1.88 | -1.88 | -1.64 | -1.58 | -1.74 | -1.72 | -1.80 | -1.76 |
| .32 | - .40 | - .38 | - .48 | - .66 | - .93 | -1.16 | -1.12 |
| 1.48 | | -1.16 | | -1.64 | | -2.16 | |
| 1.92 | 1.84 | 1.68 | 1.50 | 2.08 | 1.60 | 1.76 | 1.84 |
| 1.96 | -1.68 | -1.84 | -2.08 | -1.50 | -1.76 | -1.60 | 0 |
| .42 | - .29 | - .44 | - .62 | - .60 | - .92 | - .74 | - .26 |
| .53 | | - .80 | | -1.14 | | - .74 | |
| .06 | .06 | .15 | - .12 | .32 | - .32 | - .52 | .44 |
| 0 | - .15 | - .06 | - .32 | .12 | .52 | .32 | 0 |
| 0 | - .02 | - .02 | - .08 | .09 | .24 | .15 | .05 |
| .02 | | - .07 | | .25 | | .15 | |
| 0 | 0 | .03 | - .06 | - .16 | .16 | .10 | - .10 |
| 1.86 | 1.90 | 1.86 | 1.32 | 2.24 | 1.44 | 1.34 | 2.28 |

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Panel 5

$$-.5F + 6.5E = -2.90$$

$$5.0F - .5E = -2.52$$

$$E = -.49, F = -.55, R_5 = -.70$$

$$I_{FE} = 2(-.49 - .55/2 + .70) = .04$$

$$I_{EF} = 2(-.55 - .49/2 + .70) = -.02$$

Panel 6

$$-.77G + 5.26F = -2.76$$

$$3.01G - .65F = -3.12$$

$$F = -.66, G = -.93, R_6 = -1.20$$

$$I_{FG} = 3(-.66 - .93/2 + 1.20) = .21$$

$$I_{GF} = 3(-.93 - .66/2 + 1.20) = -.18$$

Panel 7

$$-1.02H + 4.03G = -2.25$$

$$2.52H - .93G = -2.64$$

$$G = -.91, H = -1.30, R_7 = -1.71$$

$$I_{GH} = 4(-.91 - 1.30/2 + 1.71) = .44$$

$$I_{HG} = 4(-1.30 - .91/2 + 1.71) = -.48$$

Panel 8

$$-1.04I + 2.54H = -2.40$$

$$2.52I - .90H = 0$$

$$H = -1.11, I = -.39, R_8 = -1.12$$

$$I_{HI} = 4(-1.11 - .39/2 + 1.12) = -.72$$

$$I_{IH} = 4(-.39 - 1.11/2 + 1.12) = .72$$

Influence Line Corrections - Second Set - Load at D

Panel 1

$$2.52A - .90B = 0$$

$$-1.04A + 2.54B = -.80$$

$$A = -.13, B = -.37, R_1 = -.37$$

$$M_{AB} = 4(-.13 - .37/2 + .37) = .24$$

$$M_{BA} = 4(-.37 - .13/2 + .37) = -.24$$

Panel 2

$$2.52B - .93C = -1.08$$

$$-1.02B + 4.03C = -1.17$$

$$B = -.59, C = -.44, R_2 = -.77$$

$$M_{BC} = 4(-.59 - .44/2 + .77) = -.16$$

$$M_{CB} = 4(-.44 - .59/2 + .77) = .16$$

Panel 3

$$3.81C - .65D = .76$$

$$-.77C + 5.26D = +1.60$$

$$C = .18, D = -.09, R_3 = .08$$

$$M_{CD} = 3(.18 - .09/2 - .08) = .18$$

$$M_{DC} = 3(-.09 + .18/2 - .08) = -.24$$

Panel 4

$$5.0D - .5E = 1.26$$

$$-.5D + 6.5E = -.04$$

$$D = .25, E = .01, R_4 = .20$$

$$M_{DE} = 2(.25 + .01/2 - .20) = .10$$

$$M_{ED} = 2(.01 + .25/2 - .20) = -.14$$

Panel 5

$$-.5F + 6.5E = .60$$

$$5.0F - .5E = -.21$$

$$E = .09, F = -.03, R_5 = .04$$

$$M_{EF} = 2(.09 - .03/2 - .04) = .08$$

$$M_{FE} = 2(-.03 + .09/2 - .04) = -.06$$

Panel 6

$$-.77G + 5.26F = .02$$

$$3.81G - .65F = -.44$$

$$F = -.01, G = -.12, R_6 = -.10$$

$$M_{FG} = 3(-.01 - .12/2 + .10) = .09$$

$$M_{GF} = 3(-.12 - .01/2 + .10) = -.09$$

Panel 7

$$-1.02H + 4.03G = .18$$

$$2.52H - .93G = .72$$

$$G = .13, H = .33, R_7 = .35$$

$$M_{GH} = 4(.13 + .33/2 - .35) = -.24$$

$$M_{HG} = 4(.33 + .13/2 - .35) = .20$$

Panel 8

$$-1.04I + 2.54H = .48$$

$$2.52I - .90H = 0$$

$$H = .22, I = .08, R_8 = .22$$

$$M_{HI} = 4(.22 + .08/2 - .22) = .16$$

$$M_{IH} = 4(.08 + .22/2 - .22) = -.12$$

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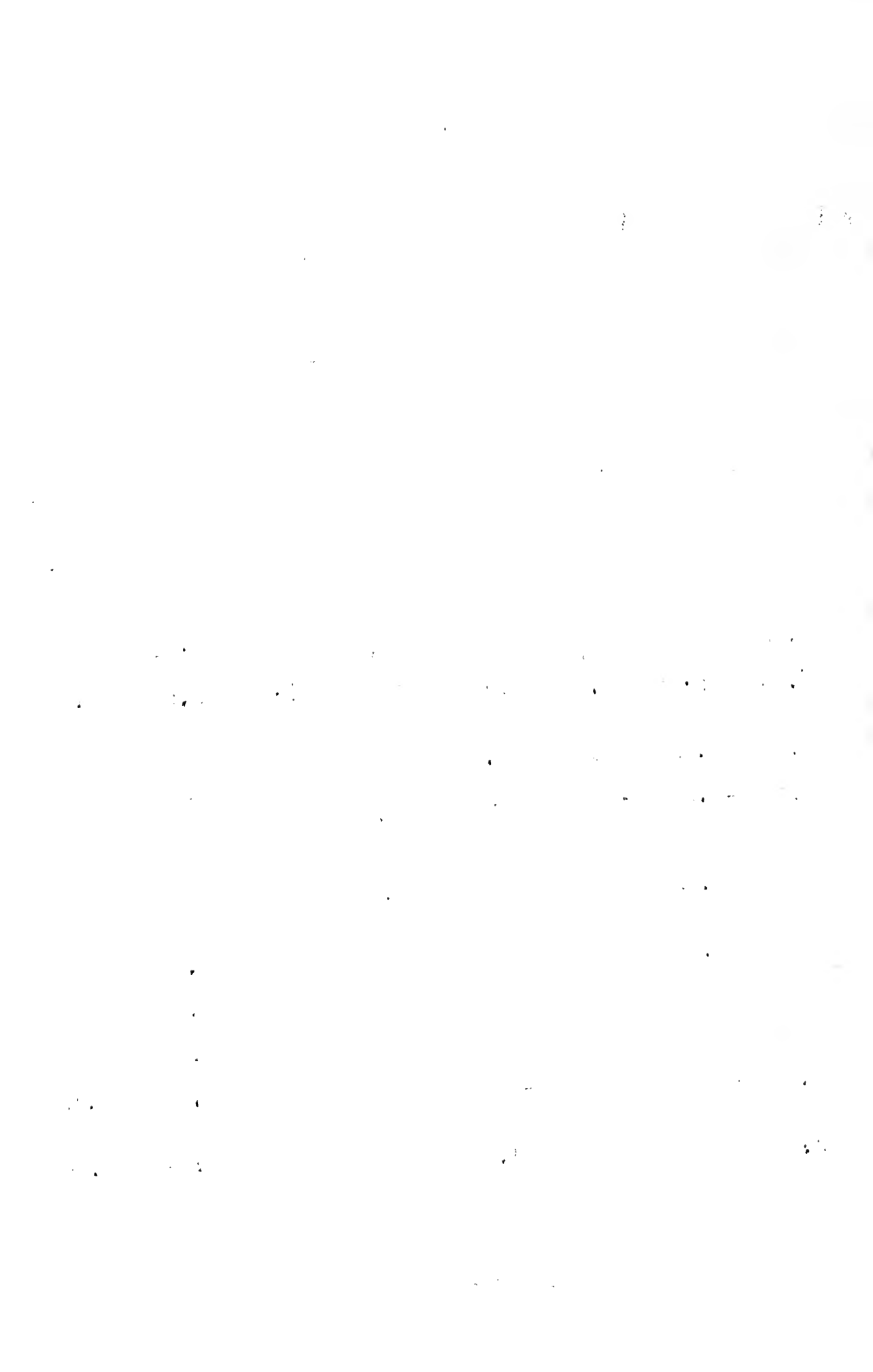
Load at D

| anel | 1 | | 2 | | 3 | | 4 | |
|------|-------|-------|-------|-------|-------|-------|-------|-------|
| oint | A | B | B | C | C | D | D | E |
| Q | 4.38 | 4.49 | 4.31 | 4.36 | 3.98 | 4.12 | -2.82 | -2.82 |
| α | 2.79 | 2.91 | 2.33 | 1.66 | 1.21 | .96 | - .61 | - .48 |
| R | 5.40 | | 4.09 | | 2.99 | | -2.23 | |
| I' | -4.64 | -4.40 | -3.72 | -5.08 | -3.90 | -4.29 | 2.76 | 2.90 |
| Q | 0 | 3.72 | 4.40 | 3.90 | 5.08 | -2.76 | 4.29 | -2.88 |
| | .61 | 1.72 | 2.32 | 1.55 | 1.28 | - .34 | .82 | - .38 |
| R | 1.74 | | 2.90 | | .72 | | .33 | |
| I'' | -1.08 | 1.08 | .80 | - .76 | 1.17 | -1.26 | .60 | - .60 |
| Q | 0 | - .80 | -1.08 | -1.17 | .76 | - .60 | 1.26 | - .04 |
| | - .13 | - .37 | - .59 | - .44 | .18 | - .09 | .25 | .01 |
| R | - .37 | | - .77 | | .08 | | .20 | |
| I''' | .24 | - .24 | - .16 | .16 | .18 | - .24 | .10 | - .14 |
| M | -5.48 | -3.56 | -3.08 | -5.68 | -2.53 | -5.79 | 3.46 | 2.16 |

Load at D

| nel | 1 | | 2 | | 3 | 4 | | |
|-----|-------|-------|-------|-------|-------|-------|-------|-------|
| int | A | B | B | C | C | D | D | E |
| Q | 4.38 | 4.49 | 4.31 | 4.36 | 3.98 | 4.12 | -2.82 | -2.82 |
| X | 2.79 | 2.91 | 2.33 | 1.66 | 1.21 | .96 | - .61 | - .48 |
| R | 5.40 | | 4.09 | | 2.99 | | -2.23 | |
| M | -4.64 | -4.40 | -3.72 | -5.08 | -3.90 | -4.29 | 2.76 | 2.90 |
| Q | 0 | 3.72 | 4.40 | 3.90 | 5.08 | -2.76 | 4.29 | -2.88 |
| | .61 | 1.72 | 2.32 | 1.55 | 1.28 | - .34 | .82 | - .38 |
| R | 1.74 | | 2.90 | | .72 | | .33 | |
| M | -1.08 | 1.08 | .80 | - .76 | 1.17 | -1.26 | .60 | - .60 |
| Q | 0 | - .80 | -1.08 | -1.17 | .76 | - .60 | 1.26 | - .04 |
| | - .13 | - .37 | - .59 | - .44 | .18 | - .09 | .25 | .01 |
| R | - .37 | | - .77 | | .08 | | .20 | |
| M | .24 | - .24 | - .16 | .16 | .18 | - .24 | .10 | - .14 |
| M | -5.48 | -3.56 | -3.08 | -5.68 | -2.53 | -5.79 | 3.46 | 2.16 |

| | 5 | | 6 | | 7 | | 8 | |
|------|-------|-------|-------|-------|-------|-------|-------|--|
| E | F | F | G | G | H | H | I | |
| 2.82 | -2.82 | -2.46 | -2.37 | -2.61 | -2.58 | -2.70 | -2.64 | |
| .48 | - .60 | - .57 | - .72 | - .99 | -1.39 | -1.74 | -1.68 | |
| 2.22 | | -1.77 | | -2.46 | | -3.24 | | |
| 2.88 | 2.76 | 2.52 | 2.25 | 3.12 | 2.40 | 2.64 | 2.76 | |
| 2.90 | -2.52 | -2.76 | -3.12 | -2.25 | -2.64 | -2.40 | 0 | |
| .49 | - .55 | - .66 | - .93 | - .91 | -1.38 | -1.11 | - .39 | |
| .78 | | -1.20 | | -1.71 | | -1.12 | | |
| .04 | - .02 | .21 | - .18 | .44 | - .48 | - .72 | .72 | |
| .60 | - .21 | .02 | - .44 | .18 | .72 | .48 | 0 | |
| .09 | - .03 | - .01 | - .12 | .13 | .33 | .22 | .08 | |
| .04 | | - .10 | | .35 | | .22 | | |
| .08 | - .06 | .09 | - .09 | - .24 | .20 | .16 | - .12 | |
| 3.00 | 2.68 | 2.82 | 1.98 | 3.32 | 2.12 | 2.08 | 3.36 | |



Influence Line Corrections - First Set - Load at E

anel 1,8

$$2.52A - .90B = 0$$

$$-1.04A + 2.54B = 2.96$$

$$A = .49, B = 1.37, R_1 = 1.39$$

$$M_{AB} = 4(.49 + 1.37/2 - 1.39) = -.88$$

$$M_{BA} = 4(1.37 + .49/2 - 1.39) = .88$$

anel 2,7

$$2.52B - .93C = 3.52$$

$$-1.02B + 4.03C = 3.15$$

$$B = 1.86, C = 1.25, R_2 = 2.33$$

$$M_{BC} = 4(1.86 + 1.25/2 - 2.33) = .60$$

$$M_{CB} = 4(1.25 + 1.86/2 - 2.33) = -.60$$

anel 3,6

$$3.81C - .65D = 4.00$$

$$-.77C + 5.26D = 3.66$$

$$C = 1.20, D = .87, R_3 = 1.55$$

$$M_{CD} = 3(1.20 + .87/2 - 1.55) = .24$$

$$M_{DC} = 3(.87 + 1.20/2 - 1.55) = -.24$$

anel 4,5

$$5.0D - .5E = 3.45$$

$$-.45D + 6.5E = -.84$$

$$D = .64, E = -.54, R_4 = .08$$

$$M_{DE} = 2(.64 - .54/2 - .08) = .58$$

$$M_{ED} = 2(-.54 + .64/2 - .08) = -.60$$

CHAPTER 1

Section 1.1

1.1.1

1.1.2

1.1.3

1.1.4

1.1.5

1.1.6

1.1.7

1.1.8

1.1.9

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1.1.24

1.1.25

Influence Line Corrections - Second Set - Load at E

Panel 1,8

$$2.52A - .90B = 0$$

$$-1.04A + 2.54B = -.80$$

$$A = -.10, B = -.28, R_1 = -.28$$

$$M_{AB} = 4(-.10 - .28/2 + .28) = .16$$

$$M_{BA} = 4(-.28 - .10/2 + .28) = -.20$$

Panel 2,7

$$2.52B - .93C = -.88$$

$$-1.02B + 4.3C = -.24$$

$$B = -.41, C = -.16, R_2 = -.43$$

$$M_{BC} = 4(-.41 - .16/2 + .43) = -.24$$

$$M_{CB} = 4(-.16 - .41/2 + .43) = .24$$

Panel 3,6

$$3.81C - .65D = .60$$

$$-.77C + 5.26D = -.58$$

$$C = .14, D = -.09, R_3 = .04$$

$$M_{CD} = 3(.14 - .09/2 - .04) = .18$$

$$M_{DC} = 3(-.09 + .14/2 - .04) = -.18$$

Panel 4,5

$$5.1D - .51E = .24$$

$$-.5D + 6.5E = -.60$$

$$D = .04, E = -.09, R_4 = -.04$$

$$M_{DE} = 2(.04 - .09/2 + .04) = .06$$

$$M_{ED} = 2(-.09 + .04/2 + .04) = -.08$$

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Load at E

| Panel | 1 | | 2 | | 3 | | 4 | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Point | A | B | B | C | C | D | D | E |
| Q | 3.51 | 3.59 | 3.44 | 3.49 | 3.18 | 3.30 | 3.75 | 3.75 |
| α | 2.22 | 2.33 | 1.86 | 1.33 | .97 | .77 | .82 | .64 |
| R | 4.32 | | 3.26 | | 2.40 | | 2.97 | |
| L | -3.76 | -3.52 | -2.96 | -4.00 | -3.15 | -3.45 | -3.66 | -3.84 |
| Q | 0 | 2.96 | 3.52 | 3.15 | 4.00 | 3.66 | 3.45 | -3.84 |
| α | .49 | 1.37 | 1.86 | 1.25 | 1.20 | .87 | .64 | -.54 |
| R | 1.39 | | 2.33 | | 1.55 | | .08 | |
| L | .88 | .88 | .60 | -.60 | .24 | -.24 | .58 | -.60 |
| Q | 0 | -.60 | -.88 | -.24 | .60 | -.58 | .24 | -.60 |
| α | .10 | -.28 | -.41 | -.16 | .14 | -.09 | .04 | -.09 |
| R | .28 | | .3 | | .04 | | .04 | |
| L | .16 | -.20 | -.24 | .24 | .18 | .18 | .06 | -.06 |
| L | -4.48 | -2.84 | -2.60 | -4.36 | -2.73 | -3.87 | -3.02 | -4.50 |

| | 5 | 6 | | 7 | | 8 | |
|------|-------|-------|-------|-------|-------|-------|-------|
| E | F | F | G | G | H | H | I |
| 3.75 | -3.75 | -3.30 | -3.18 | -3.49 | -3.44 | -3.59 | -3.51 |
| .64 | - .82 | - .77 | - .97 | -1.33 | -1.86 | -2.73 | -2.22 |
| 2.97 | | -2.40 | | -3.26 | | -4.32 | |
| 3.84 | 3.66 | 3.45 | 3.15 | 4.00 | 2.96 | 3.52 | 3.76 |
| 3.84 | -3.45 | -3.66 | -4.00 | -3.15 | -3.52 | -2.96 | 0 |
| .54 | - .64 | - .87 | -1.20 | -1.25 | -1.86 | -1.37 | - .49 |
| .08 | | -1.55 | | -2.33 | | -1.39 | |
| .60 | - .58 | .24 | - .24 | .60 | - .60 | - .88 | .88 |
| .60 | - .24 | .58 | - .60 | .24 | .88 | .60 | 0 |
| .09 | - .04 | .09 | - .14 | .16 | .41 | .28 | .10 |
| .04 | | - .04 | | .43 | | .28 | |
| .06 | - .06 | .18 | - .18 | .24 | .24 | .20 | - .16 |
| 4.50 | 3.02 | 3.87 | 2.73 | 4.36 | 2.60 | 2.84 | 4.48 |

Moment Computations - Web Members

Member AA' DL = 3510 fk
 LL-E60 = 3008
 Impact = 644
 Total = 7162

LL H15-S12-44 = 412
 Conc. = 97
 Impact = 75
 Total = 579

Sidewalk = 246

Design Moment = 7,937 fk

Member BB' DL = 3980 fk
 LL-E60 = 3395
 Impact = 725
 Total = 8100

LL H15-S12-44 = 465
 Conc. = 109
 Impact = 78
 Total = 652

Sidewalk = 278

Design Moment = 9,030 fk

Member CC' DL = 3690 fk
 LL-E60 = 3200
 Impact = 736
 Total = 7626

LL H15-S12-44 = 432
 Conc. = 101
 Impact = 80
 Total = 613

Sidewalk = 258

Design Moment = 8,497 fk

ber DD'

DL = 2422 f.k.

LL-E60 = 2193

Impact = 590

Total = 5205

LL H15-S12 - 44 = 284

Conc. = 97

Impact = 66

Total = 447

Sidewalk = 192

Design Moment = 5,844 f.k.

ber EE'

DL = 1323 f.k.

LL-E60 = 1272

Impact = 445

Total = 3040

LL H15-S12-44 = 155

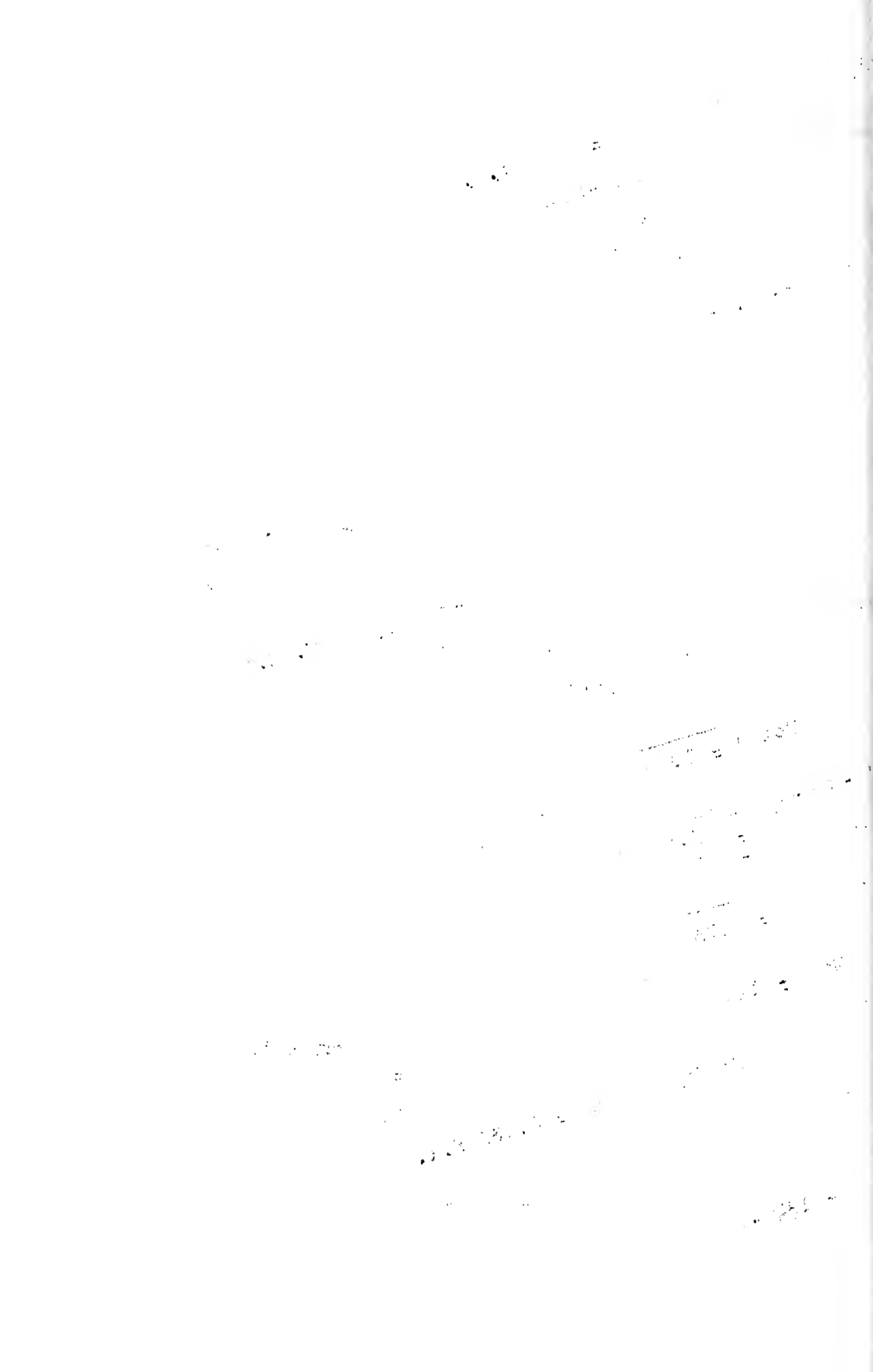
Conc. = 73

Impact = 47

Total = 275

Sidewalk = 120

Design Moment = 3,435 f.k.



Moment Computations - Chord Members

Member AB

DL = 3510 f.k.
LL-E60 = 3008
Impact = 644

Total = 7162

LL H15-S12-44 = 412
Conc. = 97
Impact = 70

Total = 579
Sidewalk = 246

Design Moment = 7,987 f.k.

Member BC

DL = 3120 f.k.
LL-E60 = 2800
Impact = 642

Total = 6562

LL H15-S12-44 = 365
Conc. = 105
Impact = 71

Total = 541
Sidewalk = 226

Design Moment = 7,329 f.k.

1000

1000

1000

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1000

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1000

er CD

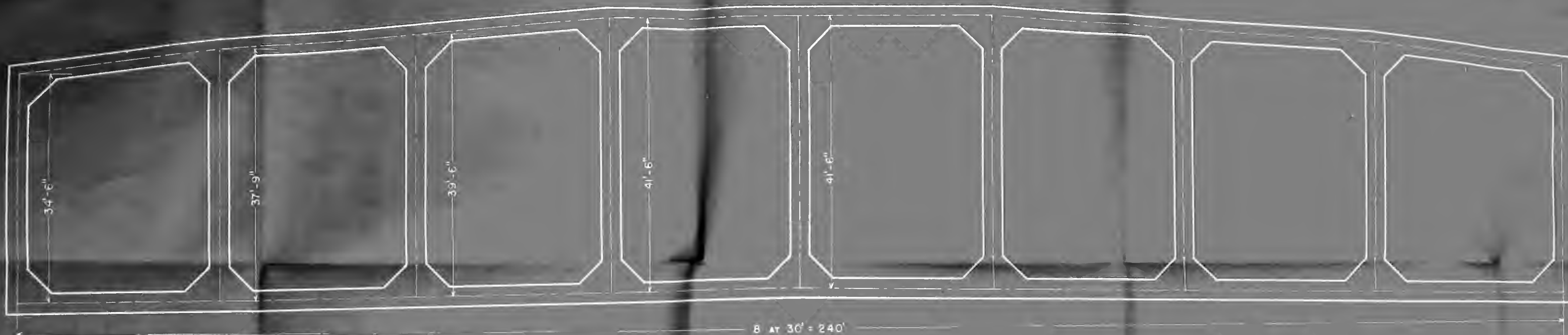
| | | |
|---------------|---|------|
| DL | = | 1828 |
| W-E60 | = | 1692 |
| Impact | = | 434 |
| <hr/> | | |
| Total | = | 3954 |
| LL H15-S12-44 | = | 214 |
| Conc. | = | 78 |
| Impact | = | 49 |
| <hr/> | | |
| Total | = | 341 |
| Sidewalk | = | 141 |

Design Moment = 4,436 f.k.

per DE

| | | |
|---------------|---|------|
| DL | = | 1172 |
| W-E60 | = | 1138 |
| Impact | = | 342 |
| <hr/> | | |
| Total | = | 2652 |
| LL H15-S12-44 | = | 137 |
| Conc. | = | 61 |
| Impact | = | 37 |
| <hr/> | | |
| Total | = | 235 |
| Sidewalk | = | 99 |

Design Moment = 2,986 f.k.



$$m = \frac{37.75 - 34.50}{37.75} = 0.0866$$

$$m = \frac{39.50 - 37.75}{39.50} = 0.0443$$

$$m = \frac{41.50 - 39.50}{41.50} = 0.0482$$

$$m = \frac{41.50 - 41.50}{41.50} = 0$$

$$m = \frac{41.50 - 41.50}{41.50} = 0$$

$$m = \frac{41.50 - 39.50}{41.50} = 0.0482$$

$$m = \frac{39.50 - 37.75}{39.50} = 0.0443$$

$$m = \frac{37.75 - 34.50}{37.75} = 0.0866$$

$$n = \frac{37.75 - 34.50}{34.50} = 0.0942$$

$$n = \frac{39.50 - 37.75}{37.75} = 0.0463$$

$$n = \frac{41.50 - 39.50}{39.50} = 0.0507$$

$$n = \frac{41.50 - 41.50}{41.50} = 0$$

$$n = \frac{41.50 - 41.50}{41.50} = 0$$

$$n = \frac{41.50 - 39.50}{39.50} = 0.0507$$

$$n = \frac{39.50 - 37.75}{37.75} = 0.0463$$

$$n = \frac{37.75 - 34.50}{34.50} = 0.0942$$

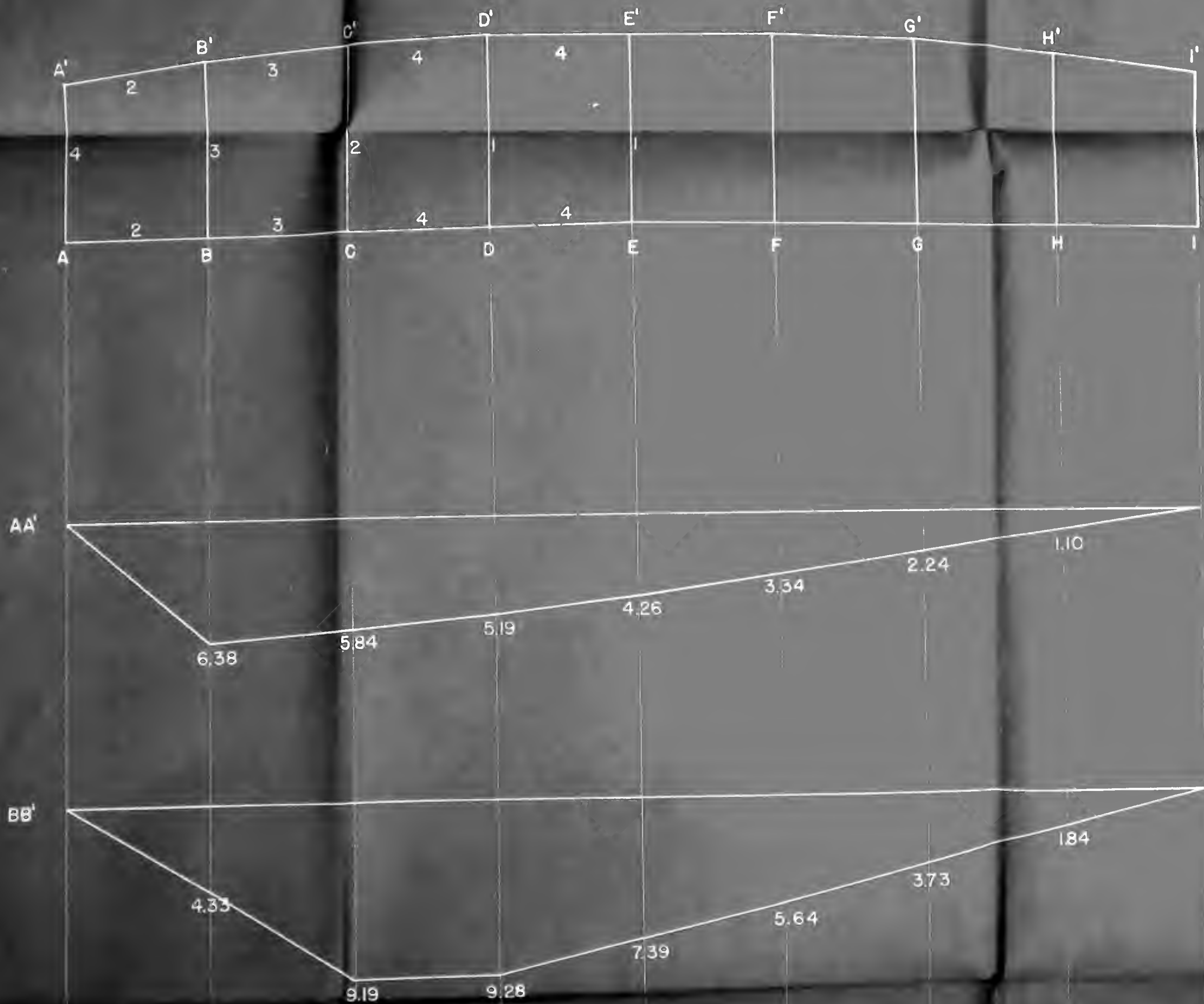
ELEVATION
VIERENDEEL TRUSS
RENSSELAER POLYTECHNIC INSTITUTE

JUNE 1946

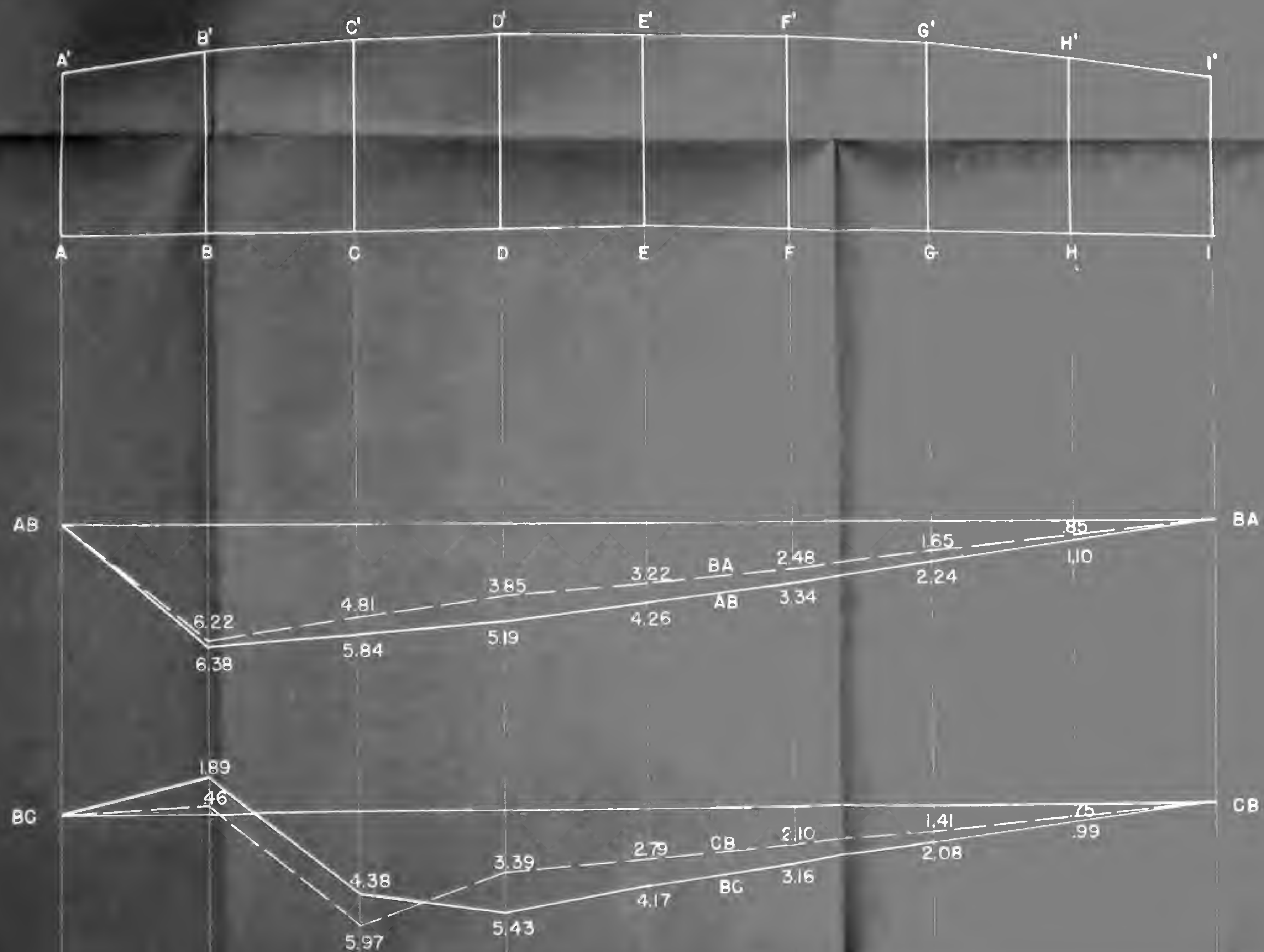
J. J. MANNING, JR.

SCALE 1" = 10'

L. H. EDING









INFLUENCE LINES

FIRST SET

VIERENDEEL TRUSS

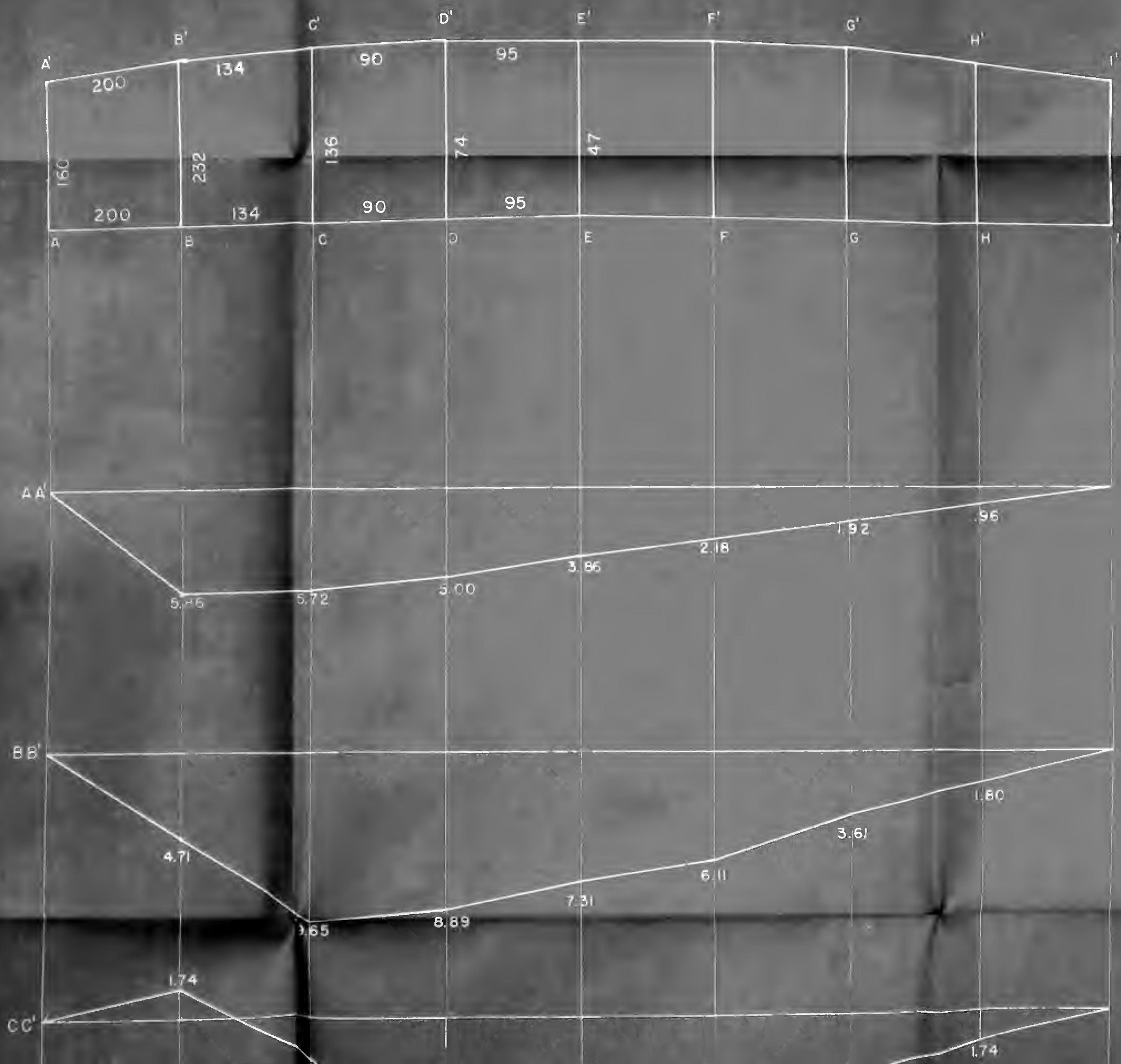
RENSSELAER POLYTECHNIC INSTITUTE

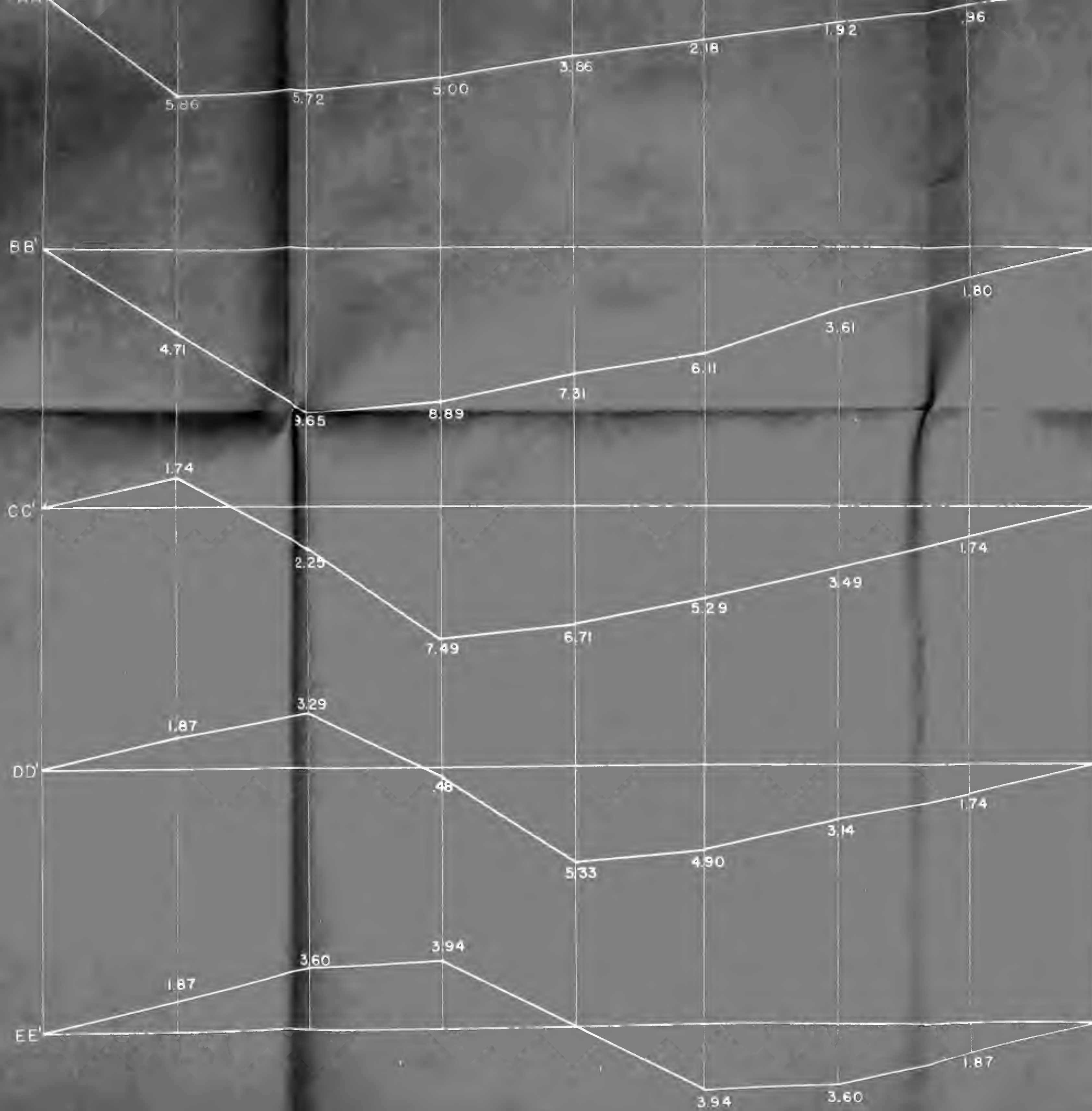
JUNE 1948

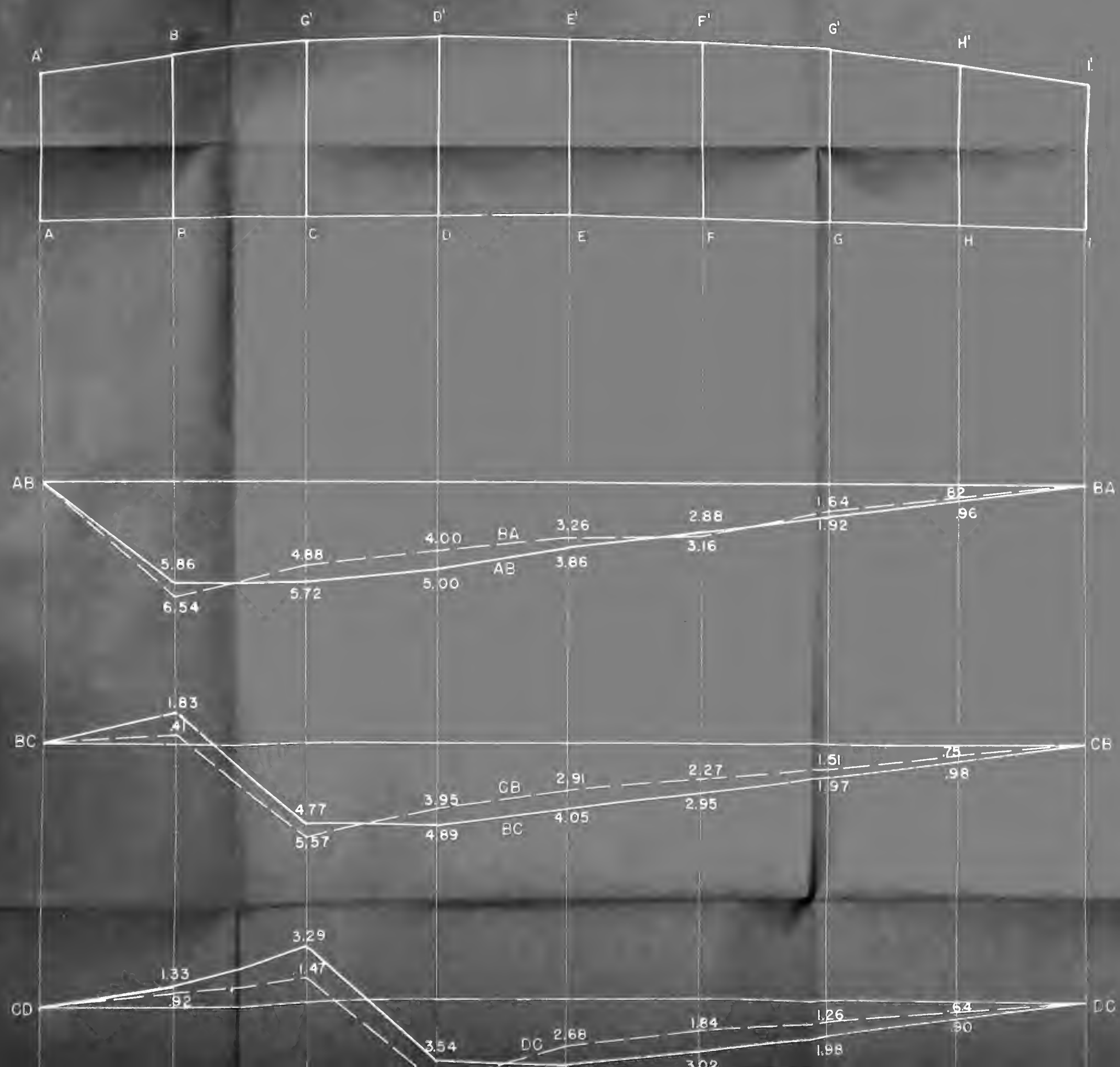
J. J. MANNING JR.

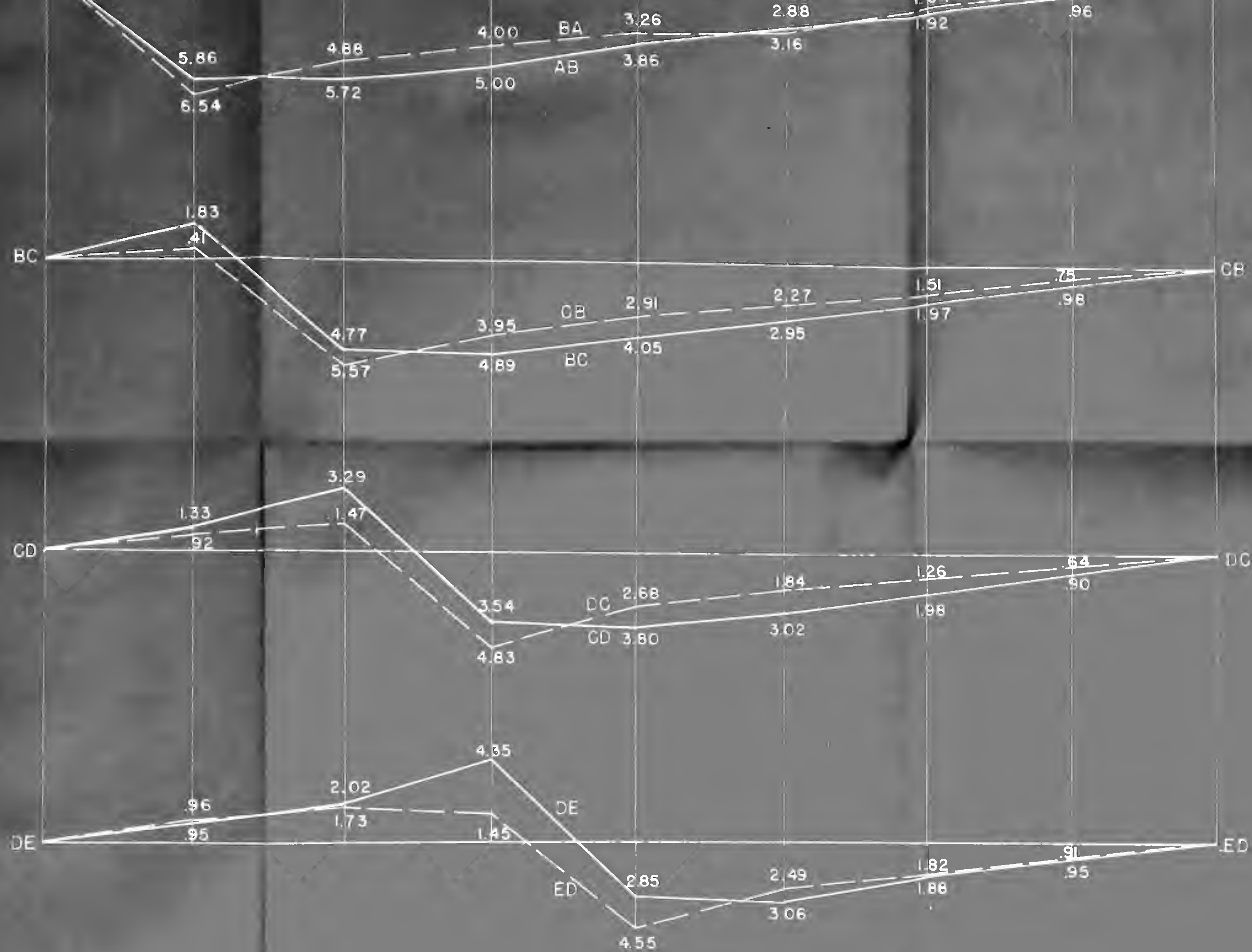
1" = 5 E. K.

L. H. EDING









INFLUENCE LINES FIRST SET VIERENDEEL TRUSS

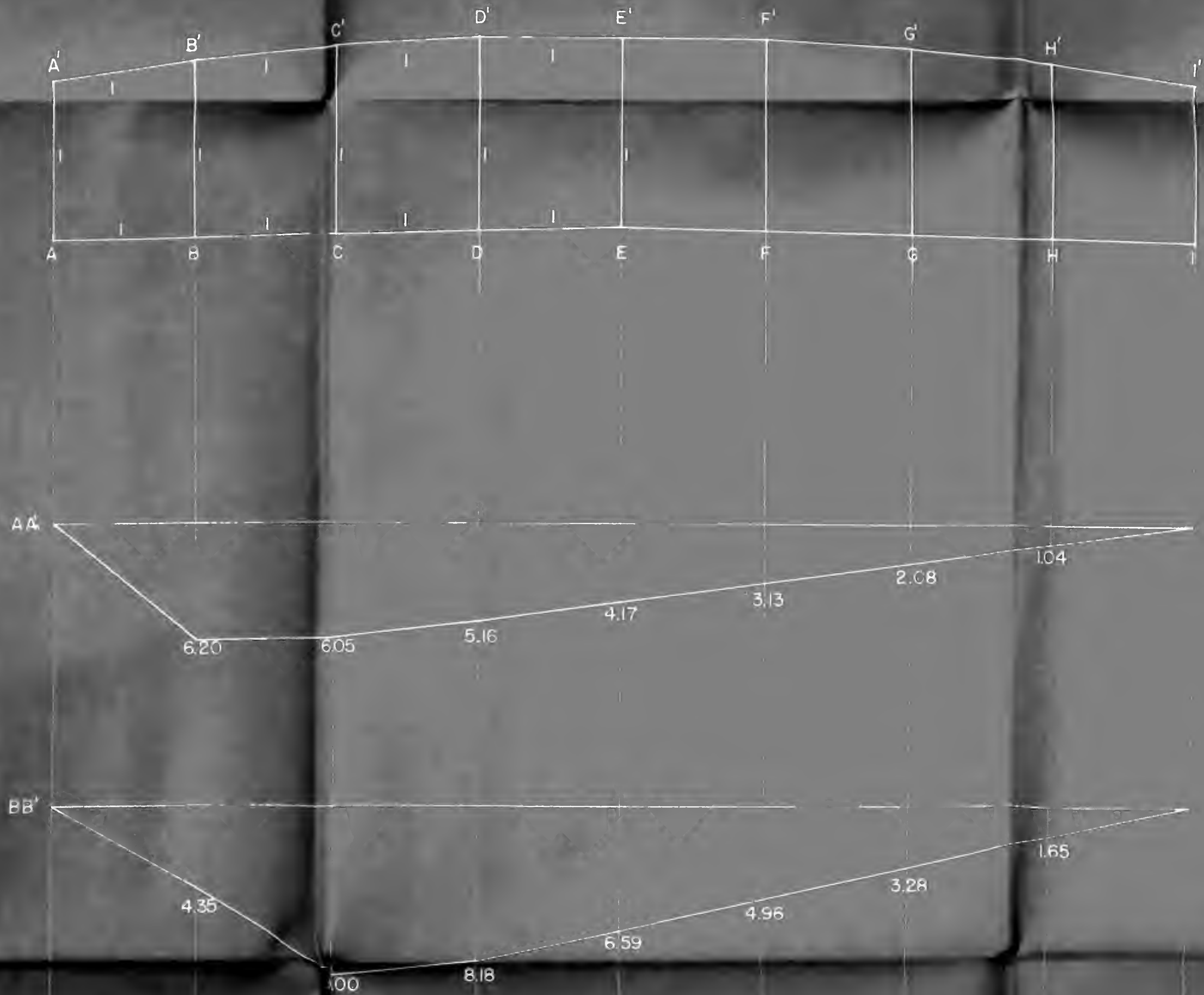
RENSSELAER POLYTECHNIC INSTITUTE

JUNE 1948

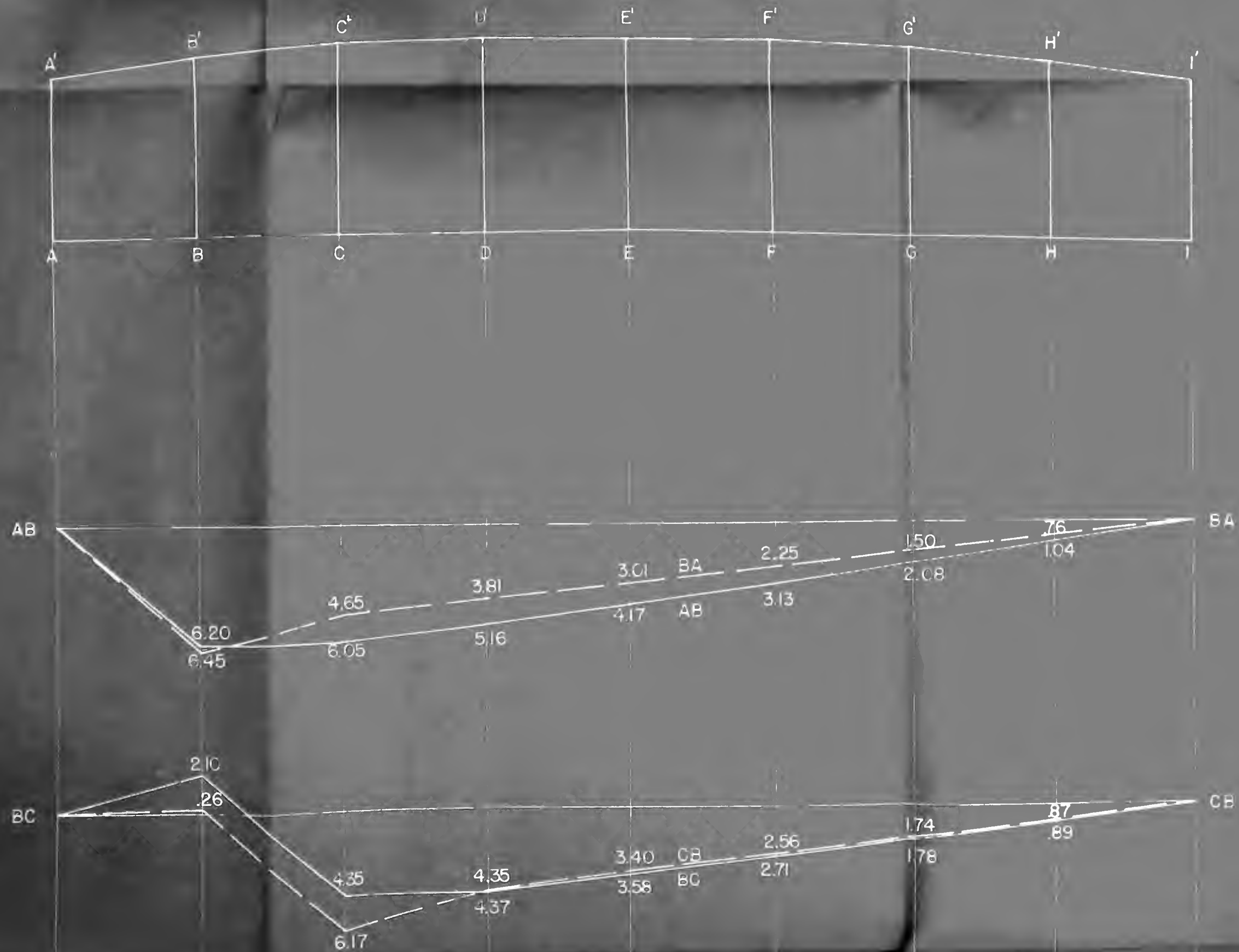
J. J. MANNING JR.

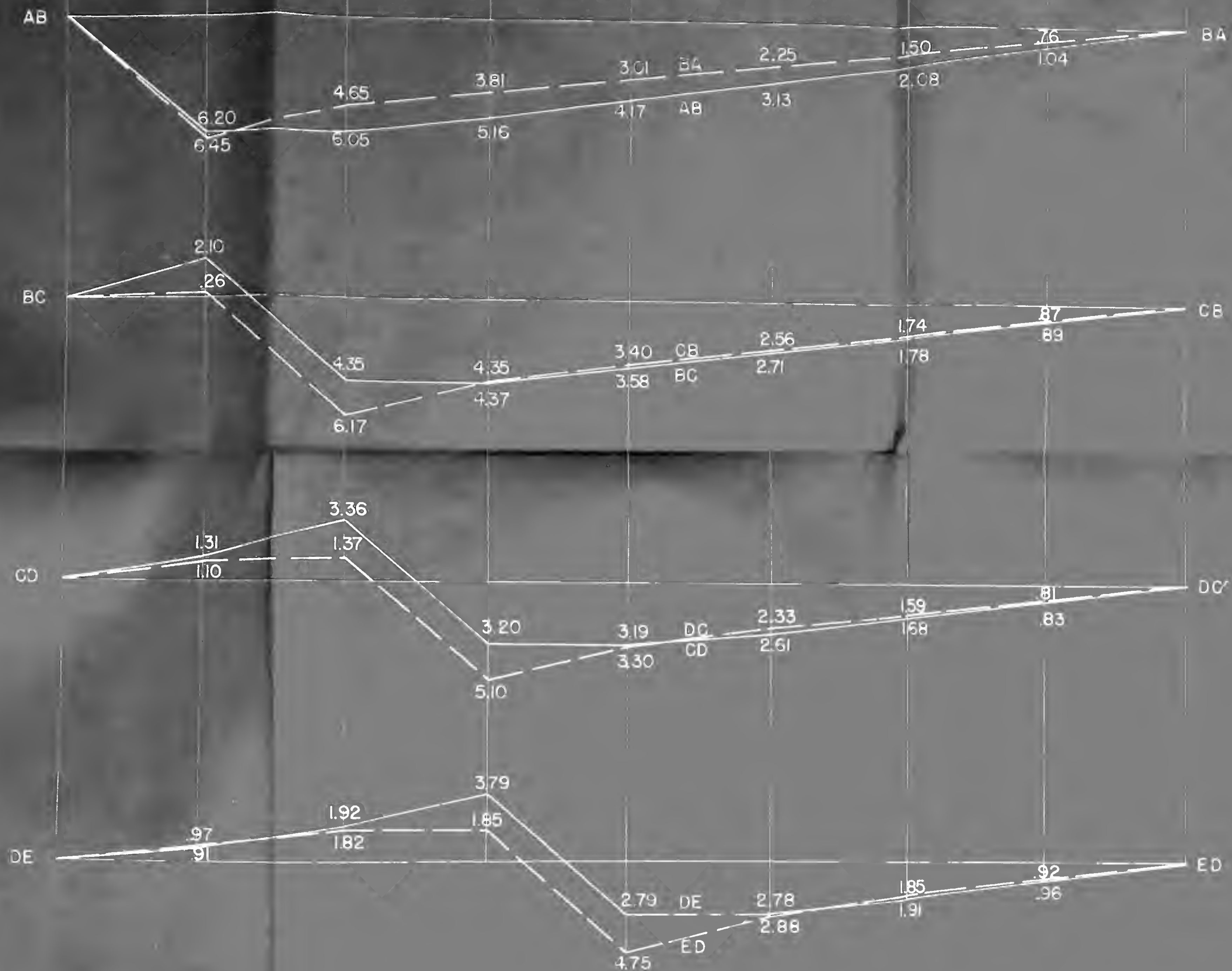
1" = 5 F.K.

L. H. EDING









INFLUENCE LINES

THIRD SET

VIERENDEEL TRUSS

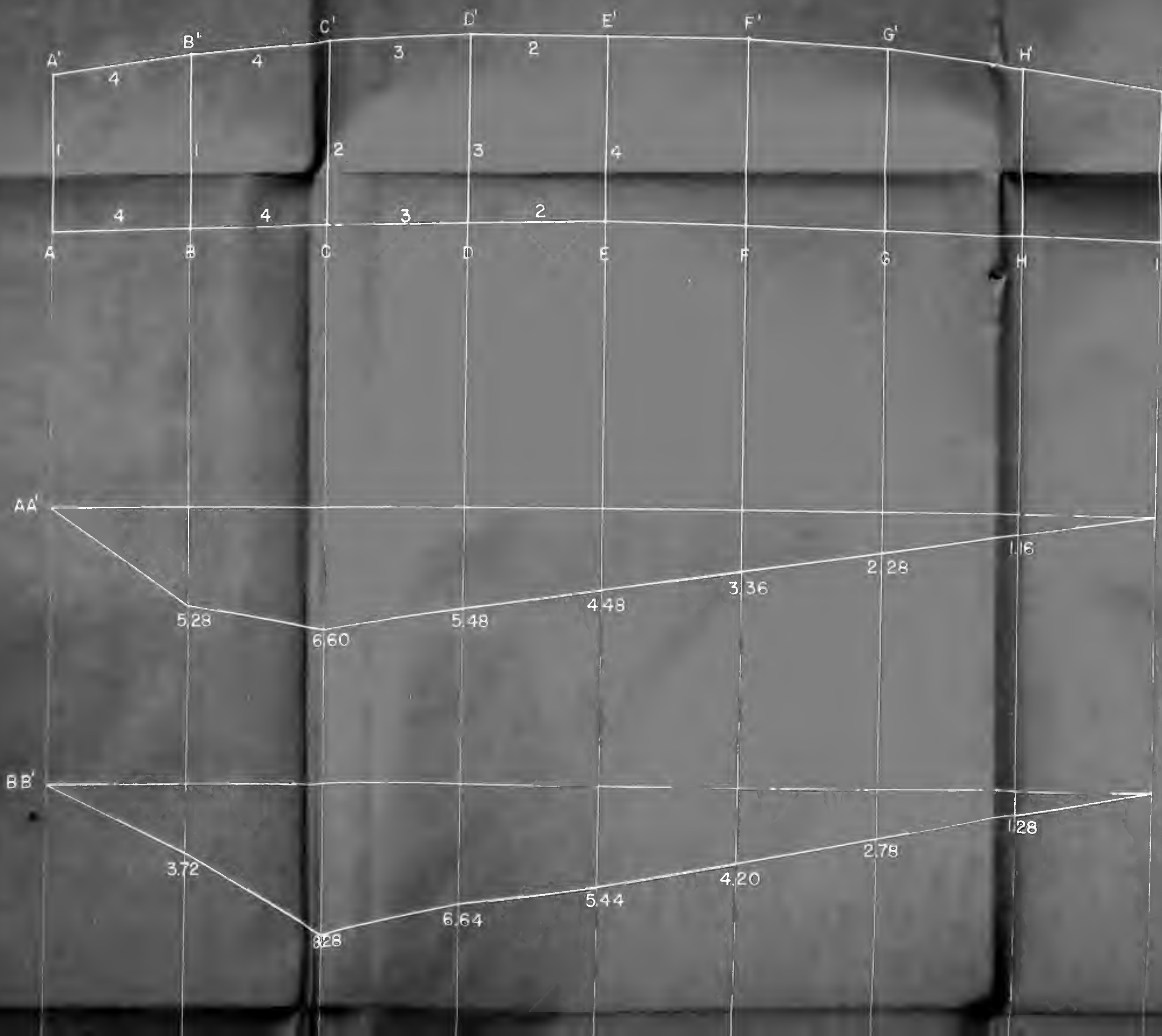
RENSSELAER POLYTECHNIC INSTITUTE

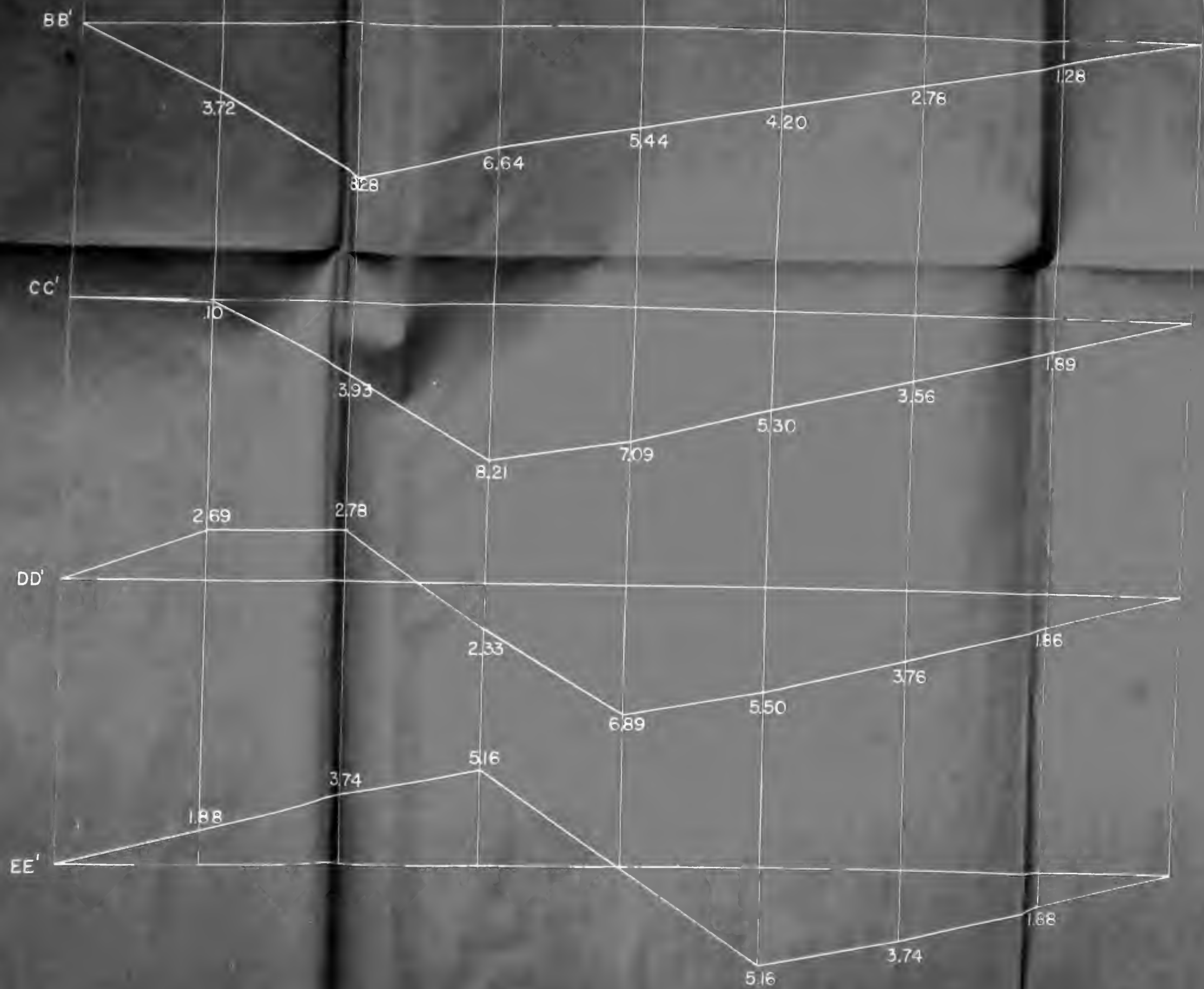
JUNE 1948

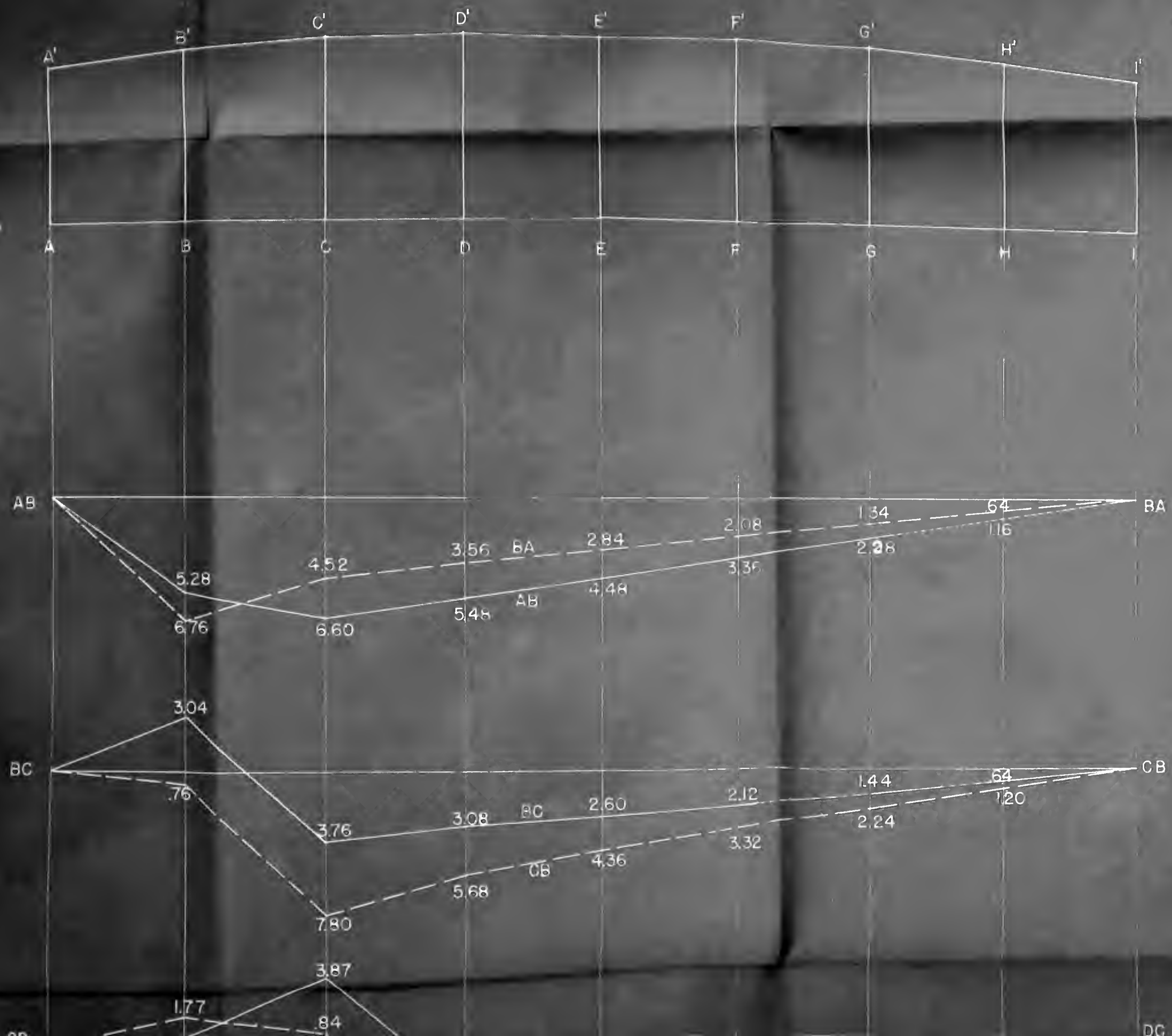
J. J. MANNING JR.

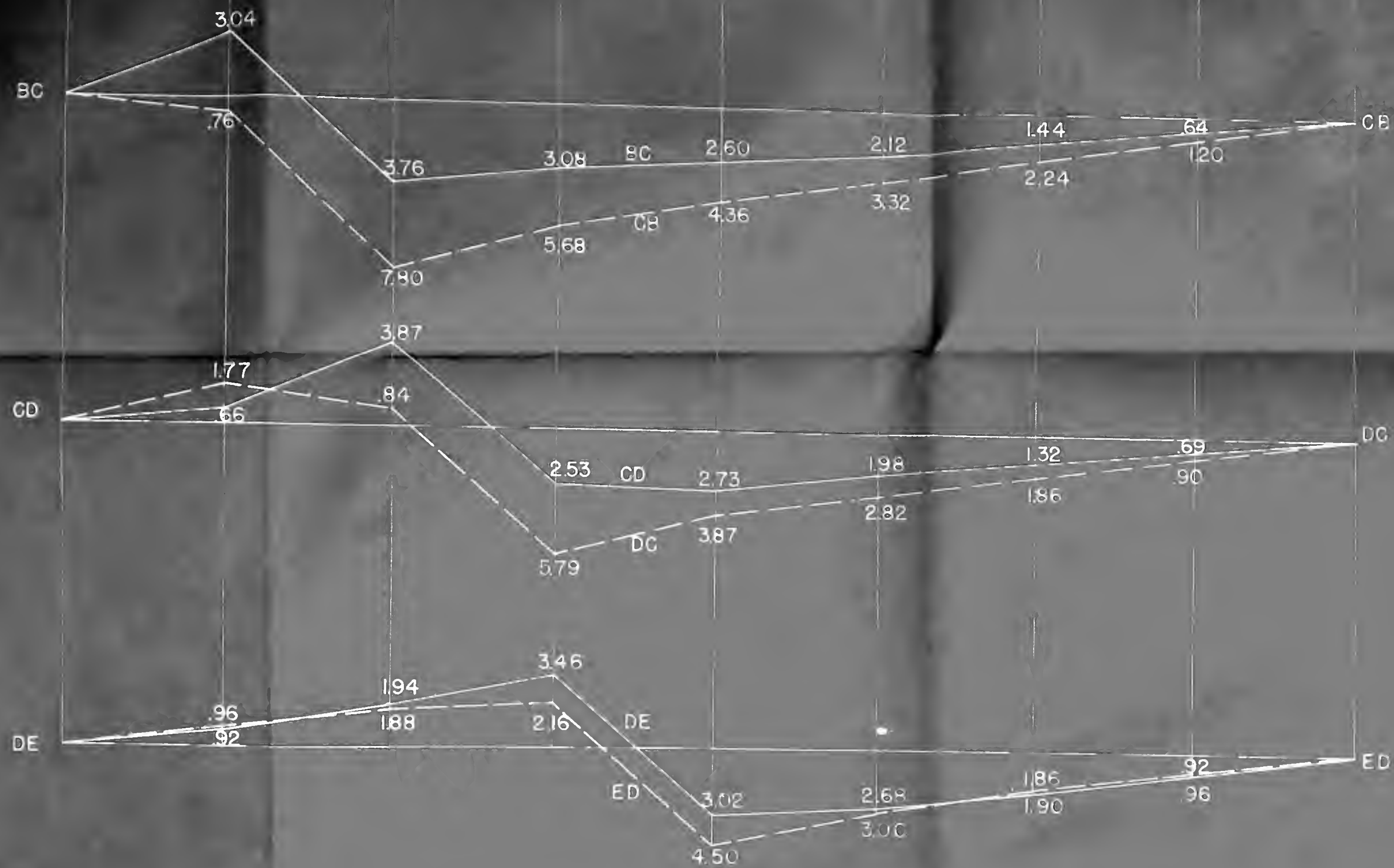
1"=5 F.K.

L. H. EDING









INFLUENCE LINES FOURTH SET VIERENDEEL TRUSS

RENSSELAER POLYTECHNIC INSTITUTE
JUNE 1948 J. J. MANNING JR.
1" = 5F.K. L. H. EDING

[illegible]

Thesis

6889

M3 Manning

Investigation of the
effect of stiffness of
members upon the solution
of Vierendeel trusses.

Thesis

6889

M3 Manning

Investigation of the
effect of stiffness of
members upon the solution
of Vierendeel trusses.

thesM3

Investigation of the effect of stiffness



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